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THE NORTH AMERICAN SPECIES OF ASCLEPIAS L.*

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INTRODUCTION

It has been over fifteen years since I began studies toward this revision. The long delay certainly has not been due to difficulty in specific delimitations, as is so frequently the case in genera of similar size; the species, for the United States at any rate, are unusually well defined and properly appreciated by the botanical public. Although this scarcely has been as true for the species of Mexico and Central America, I have occasionally wondered, through the years, whether it were not a waste of time to expend so much effort in attempting to distinguish species which already are such common knowledge.

But my primary purpose, when I began the study of Asclepiadaceae, was a definition of generic rather than of specific levels. The species of the family, as I have intimated, are for the most part very sharply defined; too sharply, one might almost say, since their differences so frequently are of the magnitude for genera in other families of Flowering Plants. This effect perhaps is a result, at least in part, of the extreme entomophily of asclepiads, as one might be led to believe by Stebbins' amplification of Schmalhausen's principle.

The vexing problems of generic limits amongst the Asclepiadaceae of North America were joined in the first paper¹ in this series. A greatly simplified system, having much in common with Decaisne's² for De Candolle's 'Prodromus', was the outcome. I still believe it to be the sensible course, conducive both to ready identification and to a proper perspective of evolution within the family. The reader, provided with Mrs. Froeschner's and Mr. Heinze's excellent drawings, may judge for himself.

When I began this series it was my intention, after reforming the generic limits for North America, to pass to the species of each genus in turn. This may not

¹Woodson, R. E., Jr. The North American Asclepiadaceae I. Perspective of the genera. Ann. Missouri Bot. Gard. 28:193. 1941.

²Decaisne, J. Asclepiadaceae, in DC. Prodr. 8:490. 1844.

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now be realized except for *Asclepias*, which was the first on the agenda. And although *Asclepias* is not the genus most in need of revision, it will provide an illustration of what I consider to be the virtues of a conservative view of genera within the family as well as a fascinating example of the evolutionary consequences of entomophily.

The long delay, aside from the routine duties which nearly every one has to face, has been due rather to the irresistible array of fascinating and complex biological questions with which asclepiads divert attention. What of the origin and function of the marvelous apparatus for pollination by insects, and of its evolutionary significance? What of the intriguing population dynamics suggested by our rich herbarium collections? It has been relatively an easy matter to check the varying accounts of the pollinating apparatus and to add what little I could. Such aspects of asclepiads have attracted the attention of botanists for nearly two centuries. Other diversions have been more consequential.

Relatively early in these studies—ten years ago or so—I became diverted by the absorbing population patterns of a single species: *Asclepias tuberosa*.³ Involving nearly half the area of the United States, together with contiguous portions of Canada and Mexico, this problem has claimed most of my meagre research time ever since, and more remains to be done. Other similar patterns, but with their unique variations, certainly exist in other species, such as *A. incarnata* and *A. asperula*. Even more fascinating may be the apparent *artenkreiss* involving *A. incarnata*, *A. fascicularis*, *A. subverticillata*, and *A. verticillata*, and the neutral polymorphism of *A. viridiflora*; the peculiar complementary clines apparent in the fruit of *A. syriaca* and *A. speciosa* doubtless will repay attention. And there are others. I look forward to them as far as time permits.

Meanwhile, however, the general *mise en scène*, in the form of this revision, should be delayed no longer or it may be never. That it is completed at last I owe to the American Philosophical Society, which enabled me to unload much onerous detail upon the capable shoulders of my student and friend Ding Hou.

COMPARATIVE MORPHOLOGY

HABIT:—

The twining habit so characteristic of the Asclepiadaceae is wholly absent from *Asclepias*. The North American species are erect herbaceous perennials predominantly; but the ubiquitous tropical and subtropical *A. curassavica* (which I believe actually may be indigenous to South America) is an annual, as are also the Antillean *A. nivea* and the Mexican *A. angustifolia*. A few species, particularly of the Gulf of California region, such as *A. albicans* and *A. subulata*, develop into twiggy shrubs.

With the exception of very few species (viz. *A. tuberosa* and *A. longifolia*) all organs of *Asclepias* are traversed by an intricate system of latex canals which are

³Woodson, R. E., Jr. Some dynamics of leaf variation in *Asclepias tuberosa*. Ann. Missouri Bot. Gard. 34:353. 1947.

responsible for names "milkweed," commonly applied to the genus in the United States and Canada, and *lechetsna* in Mexico and Central America. Neither the latex nor the prominent pericycle and phloem fibers, also frequent amongst the species, has been exploited commercially. The stele is bicollateral, as in most Contortae.

I know of no truly rhizomatous North American species, but some, as *A. syriaca*, may produce gemmiferous roots giving rise to clons of limited extent. In numerous species the perennial caudex (derived from the hypocotyl) becomes quite stout and produces annually a crop of several herbaceous flowering stems, numbering more than 50 per plant in *A. tuberosa* occasionally. In several the caudex becomes a conspicuous napiform body. Plants of *A. tuberosa* certainly attain a very great age for herbaceous perennials, and the shrubby thickets of *A. subulata* must frequently be over a century old. Even the annual *A. curassavica* may live for several years by proliferating new flowering branches from the cauline nodes.

LEAVES:—

The leaves usually are decussate. In several species, notably *A. tuberosa*, *A. viridis*, and *A. asperula*, they are rather irregularly spiral, while those of *A. verticillata* and its relatives are more or less irregularly whorled. *Asclepias quadrifolia* is of particular interest in that, although the leaves are decussate, one internode at the middle of the stem customarily is condensed to form a false whorl of four leaves; this process repeated is apparently the origin of the verticillate foliage of other species. In all species which I have cultivated, seedling leaves are decussate and this, it must be held, is the primitive phyllotaxy.

Since leaves of all Asclepiadaceae are simple and entire, in so far as the leaf outline of the North American species is restricted. In all other respects, however, variation is wide. Many species produce the glandular emergences upon the upper surface frequent for the entire family but these, unlike the situation in Apocynaceae, can seldom, if ever, be used diagnostically. An interesting adaptation to aridity is found in several of the shrubby species of the Gulf of California region, such as *A. subulata*, *A. leptopus*, and *A. albicans* and its close relatives. In these the sparse linear leaves of the young stems become caducous upon development of inflorescences; one seldom finds leaves upon herbarium specimens as a consequence. Photosynthesis here is conducted principally by the green twiggy stems which may be covered with waxy cutin to restrict transpiration.

INFLORESCENCE:—

The inflorescence of *Asclepias* is representative of the tribe Asclepiadeae as a whole. It is an umbelliform cyme, either terminal or lateral and interpetiolar. A striking feature of the umbelliform cyme is for the flowers to mature not in a strictly determinate succession but rather in an irregularly centripetal fashion. This is explained by occasional abnormal inflorescences which develop a more

elongate, obviously geniculate rachis, demonstrating the "umbel" to have been derived through condensation of a cincinnus. It also establishes the nearly hemispheric or spheric shape.

The interpetiolar position of the inflorescence is an anomaly which has intrigued morphologists for over a century. Most have concluded that such inflorescences, although lateral superficially, actually are terminal historically and that the axis system, although monopodial superficially, actually is a sympodium. With this view my own observations agree. A summary of the shoot system of *Asclepias curassavica* will illustrate the basic conditions for the genus as a whole.

Although not apparent to a casual observer, the leafy axis of *A. curassavica* consists of two well-defined regions: a basal and vegetative, and an upper and flowering. Both are erect and confluent and both bear decussate leaves. In the basal vegetative region adjacent pairs of leaves are perpendicular to one another and each leaf of a pair subtends a bud, one weakly and the other more strongly developed. The strong and the weak buds, collectively, describe parallel spirals through successive nodes. In most species of *Asclepias* neither bud develops further, and frequently even the strong bud is quite difficult to see except in dissection. In *A. curassavica*, one or more of the strong buds may eventually develop into a leafy and flowering secondary axis following the flowering or decapitation of the primary. In *A. incarnata*, on the other hand, the strong buds regularly develop into stout flowering branches. The weak buds seem either to be quite incapable of further growth or capable of producing only very stunted development under such abnormal conditions as extreme decapitation or senescence.

Upon the attainment of flowering age, the shoot of *A. curassavica* becomes changed in three respects. Firstly, pairs of leaves, formerly perpendicular to adjacent pairs, become oblique, two such pairs intersecting through two obtuse angles of approximately 120° and two acute of approximately 60° . Secondly, the strong and weak buds, instead of describing the parallel spirals noted in the vegetative portion of the stem, assume rectilinear sequences confined to two adjacent vertical orthostichies respectively to either side of the obtuse angles formed by the adjacent pairs of leaves. Lastly, the flowering peduncles appear, one to each node and inserted slightly to the right and left, successively, of the leaves subtending the strong buds, as in fig. 1. When viewed facing the obtuse angles formed by the leaves, the young flowering stem appears nearly rectilinear or very slightly skewed to the right or left at the tip; when viewed facing the acute angles, the stem has the zigzag configuration of a rhipidium. These aspects are lost upon the advent of secondary growth of the stele.

But slight variations from this plan appear throughout the genus, except in *A. tuberosa*, which will be described presently. Although it is usual for the peduncles to be inserted slightly to the right or left of the leaves subtending strong buds, the insertion is exactly interpetiolar in numerous species, as in *A. angustifolia*. Again, numerous species produce solitary terminal inflorescences; in these the uppermost pair of leaves is more or less oblique, which renders the interpretation

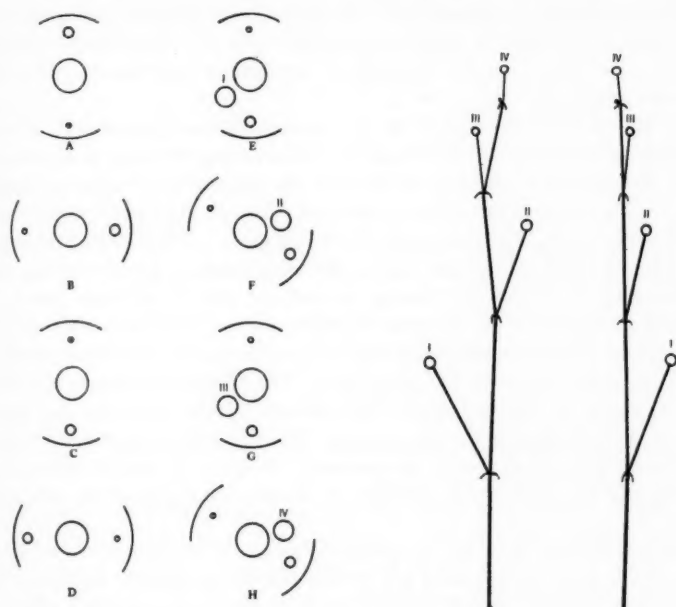


Fig. 1. *Asclepias curassavica*. A-D: vegetative nodes; E-H: flowering nodes. Explanation in the text.

of the solitary peduncle as historically the lowermost of such an interpetiolar series as that observed in *A. curassavica*.

In such species with whorled leaves, as *A. fascicularis* and *A. mexicana*, there is a tendency for the number of peduncles at a given node to correspond to the number of leaves; in *A. verticillata*, although the number of leaves in a whorl tends to be four or five, the peduncles usually are solitary. In *A. incarnata*, the upper nodes usually bear paired peduncles—one to either side of the "fertile" leaf, but this occasionally is accompanied by such more obvious signs of fasciation as irregularly whorled leaves and a flattened subtending internode.

Asclepias tuberosa differs from all other species of the genus in that the upper flowering region of the leafy axis is quite conspicuously distinct from the lower vegetative region. The latter is more or less decumbent to essentially erect, normally does not branch vegetatively, and bears numerous irregularly scattered leaves with a vague tendency to group in opposite pairs. The flowering region consists usually of two to several more or less elongate and deliquescent branches of an unmistakably scorpioid appearance. The leaves, progressively reduced in size,

usually are definitely organized into decussate pairs obliquely intersecting with obtuse and acute angles of approximately 140° and 40° respectively; the obtuse angles are dorsiventral to the deliquescent axis, which contributes further to its scorpioid appearance.

The axis is rendered scorpioid by its composition into progressively shortened sympodial constituents, each terminated by an ascending flowering peduncle almost exactly interpetiolar to the pairs of leaves in the upper obtuse angles, as illustrated in fig. 2. The scorpioid aspect here is observed when the flowering branch is viewed in profile, viz. facing the acute angles of the leaf pairs. When viewed from above, viz. facing the upper obtuse leaf angles, the axis appears somewhat zig-zag due to the association of the flowering peduncles with the slightly decussate leaves.

The flowering axis of *A. tuberosa* is so obviously and incontrovertibly sympodial and scorpioid that it is unfortunate that few morphologists who have studied the shoot of *Asclepias* apparently had access to it. The difference in aspect between the flowering axes of *A. tuberosa* and *A. curassavica* is wholly due to the fact that the former is deliquescent and the latter erect. The erect position obviously is derived from the deliquescent as seen in the persistent obliquity of the decussate pairs of flowering leaves, in *A. tuberosa* the effect of the dorsiventrality of the deliquescent axis.

A comparison of fig. 2 for *A. tuberosa* with fig. 1 for *A. curassavica* demonstrates that in both the flowering axis is scorpioid, the sympodium appearing alternately to the right or the left of the "fertile" leaf associated with the flowering peduncles. The difference is solely the alternate shift of the peduncles to the right or left of the "fertile" leaf which occurs in *A. curassavica*. This must be due to the change in polarity of the flowering shoot as a whole, i.e. from the deliquescent to the erect position.

Although the strong and weak axillary buds are observed in *A. tuberosa* only upon dissection, it is found that in this species, as in *A. curassavica*, they occur in pairs of opposed orthostichies separated by the two obtuse angles formed by the oblique intersection of the adjacent pairs of leaves. In both species the functional axis of the sympodium is associated with the "sterile" leaves, i.e. those subtending the weak buds.

Since a monochasium in plants bearing decussate foliage is ordinarily derived through modification of a dichasium, we may next search for the missing complementary sympodium. This surely must be represented by the strong axillary buds which, in fact, occasionally develop short flowering branches in *A. tuberosa*.

There remains to explain the weak buds of the orthostichies of leaves which, according to my view, historically subtend the axes composing the sympodium. Certain formalistic morphologists, in my position, probably would dismiss the weak buds as "accessory" or "supernumerary." This I also am prepared to do. It is an anatomical axiom, probably as well as a physiological necessity, that an angiospermous leaf should subtend a bud; whence the appearance of an accessory bud after the assumption of the functions of a primary axis by the erstwhile axillary branch.

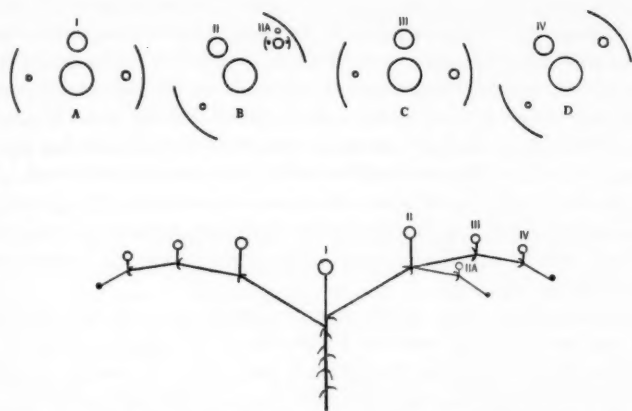


Fig. 2. *Asclepias tuberosa*. A-D: flowering nodes. Explanation in the text.

It follows that the vegetative basal portion of the leafy axis of *A. curassavica*, and probably all other species of the genus, is helicoid and a bostryx, while the upper flowering portion is scorpioid and a cincinnus.

Much effort has been expended by morphologists, from the time of the Bravais brothers⁴ in 1837 to that of Schoute⁵ a century later, in attempting to explain why the terminal peduncles of asclepiads should be interpetiolar and not placed in the axil of the leaves. The Bravais' conceived the notion that the cause was crowding out (*déjetement*) of the peduncle by the strong bud, and in this they are followed by Schoute who, however, finds it a bit difficult to explain why the "*déjetement*" should be complete in some cases and only partial in others. Just why a terminal axis should be required in an axillary position appears difficult to reconcile. While recognizing that morphologically terminal flowers in uniparous cymes frequently do appear to be subtended by a leaf or bract, their association with it should be understood as a derived one and in no sense historical. It appears to me wholly gratuitous to argue that the admittedly terminal peduncle has been crowded from an axillary position by the notably quiescent "strong" bud, with which the peduncle is associated only because the "strong" bud is the missing sympodium of the former dichasium. If both were axillary and actual pressure a factor, one would expect the bud to be displaced instead.

⁴Bravais, L., and A. Bravais. Essai sur la disposition symétrique des inflorescences. Ann. Sci. Nat. Ser. II, 8:11. 1837.

⁵Schoute, J. C. The interpetiolar inflorescence of *Vincetoxicum* and *Asclepias*. Rec. Trav. Bot. Néerl. 34:182. 1937.

An interesting historical summary of various rationalizations of the interpetiolar inflorescence has been compiled by Schoute,⁶ to which the reader is referred. Schoute founds his own contribution, which deals with but one species of *Asclepias* (*A. curassavica*), upon the assumption of a primitive spiral phyllotaxy. According to him, the alternate weak and strong buds are proof that the leaves have been laid down in a spiral from which, by metopy, a decussate readjustment has been made. This is maintained in spite of the fact, which we already have noted, that the juvenile phyllotaxy of all asclepiads is decussate, whatever the arrangement in the adult, and that by far the predominant adult phyllotaxy not only of Asclepiadaceae but of such related families as Apocynaceae, Gentianaceae, Loganiaceae, and Oleaceae, is decussate as well.

Having elected the spiral as the primitive phyllotaxy, Schoute considers the question whether the strong buds are in the axils of the upper or the lower leaves in the broken spirals composing the decussate leaf pairs. By a series of formalistic diagrams and the assumption that the peduncles were originally axillary, he comes to the conclusion that the strong buds are subtended by the upper leaves and the weak buds (taken as of equal structural value to the stronger) subtended by the lower. No explanation of the inequality is advanced, contrary as it is to ontogenetic expectation.

As a further consequence of the hypothesis of spiral phyllotaxy, we are forced to the corollary of a primitive condition of alternate fertile and sterile nodes, a formidable anomaly in itself. Incidentally, for *A. curassavica* Schoute⁷ figures a spiral of three bracts borne upon the flowering peduncle. These, in fact, are quite fictitious, since the peduncles of all species of *Asclepias* are naked. As an important confirmation of his theory of basic spiral phyllotaxy, Schoute also figures alternate interpetiolar hair-lines for the leaf pairs of *A. curassavica*. Although I have seen such alternate hair-lines in *A. incarnata* and other species, my own cultures of *A. curassavica*, grown from seed, invariably show opposite hair-lines. Variability in this respect may well involve a relatively simple Mendelian solution. It is also rather disturbing for Schoute to quote the Bravais', quite without dispute, that in *A. syriaca* the peduncles are "placed almost exactly between the two petioles, whereas in *A. tuberosa* [there is] very little extra-axillarity,"⁸ when the true situation is exactly the reverse.

FLOWER: CALYX:—

The flowers of *Asclepias* invariably are actinomorphic. The calyx consists of five equal and essentially separate, ovate to lanceolate, more or less foliaceous lobes which are open in aestivation. At their base, within, usually may be found few to several minute glandular emergences ("squamellae") which are the homologues of the foliar and nodal glands as in Apocynaceae.⁹ They appear to have no diagnostic value in *Asclepias*.

⁶Schoute, J. C. loc. cit. 1937.

⁷Schoute, J. C. loc. cit. fig. 2. 1937.

⁸Schoute, J. C. loc. cit. p. 191. 1937.

⁹Schoute, J. C. loc. cit. p. 191. 1937.

COROLLA:—

The corolla is rotate, with an extremely shallow annular tube. The five equal lobes, valvate or barely contorted in aestivation and usually ovate-elliptic in outline, ordinarily are sharply reflexed at anthesis but in numerous species spread horizontally. In *A. pedicellata* the narrow corolla lobes are erect or nearly so, imparting a tubular aspect. Coloration is in various shades and combinations of white, red, or yellow, occasionally with a suffusion of purple.

GYNOSTEGIUM: ANDROECIUM:—

The fascination of the asclepiad flower resides in the stamens. Five in number and antesealous, the stamens are united with the fleshy *stigma head* to form the characteristic structure of Asclepiadaceae known as the *gynostegium*. The filaments are coherent into a tube known as the *column* and adnate collectively to the base of the annular corolla tube.

The bilocular anthers are rather broadly oblong or subquadrate and tipped with a triangular hyaline appendage inflexed over the stigma head. The outer lateral margins of each are bordered with more or less dilated, frequently corneous *wings* which are applied nearly face to face with the adjacent wings of the neighboring anthers and at an obtuse angle to the back of each. The anther wings guard the entrances to the five *stigmatic* (or "alar") *chambers* and frequently are notched or spurred, an ornamentation which may be connected in some way with selective pollination. The anthers are somewhat flattened dorsiventrally; the two vertical pollen sacs dehisce introrsely by a prominent apical pore.

Although the anthers appear dorsally to be free from one another because of their prominent wings, actually they are completely coherent ventrally except near their tips; conversely, the coherent portions of the anthers are free from the stigma head (although closely applied to it) except near their tips where the wings are strongly adnate separately, and at the base where they form an adnate ring. It thus obtains that the so-called "stigmatic chambers" actually are formed by the anthers themselves, except at their tips where access is gained to the true stigma (pl. 3, fig. 1).

CORONA:—

The most variable structure of asclepiadaceous flowers is the *corona* which, in *Asclepias*, consists of five separate organs, the *hoods*, borne at the summit of the column and subtending the anthers. Alternating with the hoods are five minute, more or less ligular organs, sometimes entire but usually more or less deeply bifid and involute under the paired anther wings, which I call the *alternating lobules*. The hoods obviously are enations of the staminal filaments and have their simpler counterparts in several other families of Angiosperms (cf. *Forsteronia* subgen. *PTERANTHERA* of Apocynaceae). The alternating lobules, on the other hand, probably are of double nature and constituted in part by each of the adjacent stamens; but this is more easily demonstrated when they are deeply bifid and less

⁹Woodson, R. E., Jr., and J. A. Moore. The vascular anatomy and comparative morphology of apocynaceous flowers. Bull. Torrey Bot. Club 65:135. 1938.

so when entire. The hoods are nectaries and provide the attraction for the insect visitors. One frequently finds them overflowing with viscid colorless nectar shortly after anthesis of the flower. Upon several occasions I have found a hood to contain a single colorless transparent crystal of tabular form and measuring more than 1 mm. square, obviously condensed from the nectar.

The hood has been the chief source of the generic segregates of *Asclepias*. It is a rather complex organ and its variations almost defy description. In what I take to be its primitive form, the hood is a simple shovel- or scoop-shaped body of delicate texture, open at top and front, attached to the column by a short but slender substipitate base, and bearing within toward the base a slender incurved acicular process of slightly greater length which is called the *horn*. The papillate cells which secrete the nectar are found chiefly toward the base of the horn.

PHYLOGENY OF THE HOOD:—

Diversification of the hoods seems to have proceeded in the following directions although not always *seriatim*: 1, generally toward a more fleshy texture; 2, toward elimination of the substipitate base through decurrence upon the column until a deep pouch is attained; 3, elongation and deflection and involution of the margins to produce a clavate form; 4, elimination of the horn through various degrees of adnation; 5, basal prolongation upward to produce a more or less elevated *stipe* bearing the alternating lobules and the anther head at the summit. In varying degrees more or less consistent with these trends of the hoods both the column and the anther head become broader and more squat until, in the final series and subgenera, the column is virtually eliminated and the gynostegium is essentially sessile.

By far the greatest number of the North American species of *Asclepias* are included within the "primitive" subgenus *ASCLEPIAS*. Here systematization of the species upon a continental scale is really a difficult matter and upon it I have spent most of the years of this study, particularly upon fresh flowers which I have obtained in the field, and flowers in "spirits" sent me by a host of generous friends and acquaintances. The result, I fear, is what will appear to be a decidedly recondit system based upon the natural contours of the hoods particularly with respect to the dorsal view: whether broadly rounded, broadly flattened (compressed tangentially), or more or less sharply keeled (compressed radially).

These details have been generally ignored previously, as the shapeless, baggy hoods of even the best of previous illustrations usually will witness. Unfortunately, they are difficult to observe from herbarium specimens at times. But they are consonant with the more general phylogenetic diversifications which have been discussed above: both the rounded and the flattened types appear to be primitive as seen by their nearly free horns and tendency toward substipitate bases; the keeled type would be advanced because of its usually strongly adnate horn and tendency toward a basal pouch. Such are the phylogenetic sequences upon which I have constructed my classification of the North American species. They are beautifully illustrated by Mrs. Froeschner and Mr. Heinze in the taxonomic section which follows.

GYNOECIUM:—

The gynoecium of *Asclepias* is quite typical of the family. It consists of two wholly superior carpels completely free save at the common *stigma head*. The ovules are anatropous and multiseriate upon the ventral placenta. The stigma head is a relatively massive structure supported by the free styles of the carpels from which it is rather abruptly produced; it is roughly an inverted and truncate, pentagonal pyramid, the sides of the pentagon formed by the connivence of the five anthers.

Although the top of the stigma head has an epidermis of papillate cells they are not glandular and do not receive the pollinia, as is well known. The lateral "angles" of the pentagon are scarcely such, geometrically speaking, for they are truncate and furrowed, and it is here that the secretory epidermis is located (pl. 2, fig. 1). These five furrowed "angles" of the stigma head are roughly in the form of a cross with obliquely descending arms. The head and the arms of the cross, of varying dimension and contour characteristic of each species, are the place of origin of the translator apparatus of the pollinia; the foot of the cross is the receptive surface of the stigma.

POLLINIUM:—

In 1811 Robert Brown¹⁰ separated his natural order Asclepiadeae from the Apocineae of Jussieu upon the basis of the highly specialized pollinia of the former. His differentiation of the two groups remains the boundaries of the present-day families Asclepiadaceae and Apocynaceae, respectively.

Although quite analogous to those of the orchids the *pollinia* of asclepiads are a much more elegantly contrived apparatus for entomophily. Two special forms exist in the family characteristic of the subfamilies Periplocoideae and Cynanchoideae. Those of the latter, which includes the genus *Asclepias*, consist of two (or four in the tribe Secamoneae) completely enclosed packages of pollen grains (*pollinium sacs* or *pollinia proper*) united by more or less of a yoke-like process of each (*translator arms* or *retinacula*) to a common sagittate body known variously as the *gland* or *corpusculum*.

The gland, as we shall refer to it here, is dark brown usually and of a corneous consistency; it is compressed radially, with the inner surface smooth and entire but the outer with a narrow slit passing almost completely through it from top to bottom. This slit is of the utmost importance to its transportation by insects.

The translator arms, sometimes virtually lacking in genera other than *Asclepias*, are usually more narrow, often quite elaborately winged or fluted ribbons of yellow cartilaginous substance attached at either side toward the base of the gland, on the one hand, and on the other, to the tips of the pollinium sacs. The pollinium sacs, of semi-transparent yellowish substance, in *Asclepias* are strongly compressed, more or less asymmetrically pyriform bodies pendulous from their respective translator

¹⁰Brown, R. On the Asclepiadeae. Mem. Wern. Soc. 1:12. 1811.

arms. Under magnification the pollinium sacs appear as a faint mosaic of roughly hexagonal areolae which mark the position of the pollen grains.

Although the essential function of the pollinia of asclepiads had been recognized at least as early as Tournefort, their exact nature and origin were in doubt not only in the time of Robert Brown but for over a half century subsequently. That doubt should continue after Brown is scarcely conceivable; for with his characteristic inquisitiveness and insight (as well as his habitually laconic simplicity) he had discovered the basic facts of the development of the pollinia of *Asclepias syriaca* from fresh dissections alone and with only the crude magnifiers of his age. Scarcely a better introduction to the development of asclepiad pollinia, nor tribute to the acuity of Brown, could be provided than his own words:¹¹

"The flower-bud of this plant [*Asclepias syriaca*] I first examined, while the unexpanded corolla was yet green and considerably shorter than the calyx. At this period, the gland-like bodies which afterwards occupy the angles of the stigma were absolutely invisible; the furrows of its angles were extremely slight, and, like the body of the stigma, green; the antherae, however, were distinctly formed, easily separable from the stigma, and their cells, which were absolutely shut, were filled with a turbid fluid, the parts of which did not so cohere as to separate in a mass; of the cuculli [hoods], which in the expanded flower are so remarkable, and constitute the essential character of the genus, there was no appearance.

"In the next stage submitted to examination, where the corolla nearly equalled the calyx in length, the gland-like bodies of the stigma were become visible, and consisted of two nearly filiform, light brown, parallel, contiguous and membranaceous substances secreted by the sides of the furrow, which was now somewhat deeper: Instead of the filiform processes [translator arms], a gelatinous matter occupied an obliquely descending depression proceeding from towards the base of each side of the angular furrow.

"In a somewhat more advanced stage, the membranes which afterwards become the glands of the stigma, were found to be linear, closely approximated, and to adhere at their upper extremity. At the same time, the gelatinous substance in the oblique depression, had acquired a nearly membranaceous texture and a light brown colour, and on separating the gland from its furrow, which was then practicable, this membrane followed it. At this period, too, the contents of each cell of the anthera had acquired a certain degree of solidity, a determinate form, and were separable from the cell in one mass; the cuculli were also observable, but still very small and green, nearly scutelliform, having a central papilla, the rudiment of the future horn-like process. Immediately previous to the bursting of the cells of the antherae, which takes place a little before the expansion of the corolla, the cuculli are completely formed, and between each, a pair of minute, light green fleshy teeth [alternating lobules] are observable, the single teeth of each pair being divided from each other by the descending alae of the antherae. The glands of the stigma have acquired a form between elliptical and rhomboidal, a cartilaginous texture, and a brownish-black colour; they are easily separable from the secreting furrow, and on their under surface there is no appearance of a suture, or any indication of their having originally consisted of two distinct parts; along with them separate also the descending processes, which are compressed, membranous, and light brown; their extremity, which is still unconnected, being more gelatinous but not perceptibly thickened. The pollen has acquired the yellow colour and the degree of consistence which it afterwards retains. On the bursting of the cells, the gelatinous extremity of each descending process becomes firmly united with the upper attenuated end of the corresponding mass of pollen . . ."

Contrary to what one might expect, the discerning observations of Brown were neither immediately accepted nor even subjected to verification. As late as 1857 the pioneer morphologist Payer¹² believed the "gland" of the pollinia to be a real

¹¹Brown, R. loc. cit. pp. 14-16. 1811.

¹²Payer, J. B. *Traité d'organogénie comparée de la fleur*. 1:569. Paris, 1857.

gland whose secretions trickle down the two descending furrows of each angle of the stigma head to form the translator arms, and finally into the anther loculi to cement the pollen grains. He had not observed, as had Brown, that the translator apparatus and the pollinium sacs must necessarily be formed independently since both are completed prior to dehiscence of the anthers!

ONTOGENY OF THE TRANSLATOR:—

It is a simple matter to verify and to amplify Brown's account of the origin of the translator apparatus with modern microtome sections. In very young buds of *Asclepias curassavica* the furrows of the five angles of the stigma are found to be lined with closely packed, deep, but exceedingly narrow secretory cells. The appearance of the gland is first noticed as two isolated lines of lipoid substance formed on the outer margins of the furrow (pl. 2, fig. 2). These thicken greatly, and their semi-solid nature is demonstrated by striations formed by the accretions from each glandular cell. In time, intervening cells of the furrow also become secretory, bringing together the originally isolated margins which have now become particularly thick and approximated, thus forming the dorsal slit (pl. 2, fig. 4).

The secretory cells of the obliquely descending furrows of the angles are not as closely packed, narrow, nor deep as those which secrete the gland. Their secretions are much more scanty and apparently more fluid since the translator arms which they form are not striated as is the gland. They stain very much less deeply with safranin than either the gland or the enclosing membranes of the pollinium sacs (pl. 2, figs. 5-6). A more detailed histological account of the development of the translators of *Asclepias syriaca* has been published by Corry¹³, completely corroborating the account of Brown.

Robert Brown was unable to investigate the nature of the enclosing membranes of the pollinium sacs because of technical limitations of his age. Payer¹⁴ also, limited to macroscopic dissections, could only conjecture concerning it. Both Brongniart¹⁵ and Schleiden¹⁶ considered the pollinium sacs to be confined by a cellular layer derived from outer sterile cells of the pollen mass, probably misled by the mosaic of hexagonal areolae previously noted above. Corry, much more convincingly, concluded that the vertical wall of each of the tapetal cells adjacent to the pollen grains undergoes "conversion into cutin", and that this change is followed successively by a like conversion of all the walls surrounding the pollen grains. This is not far from the truth.

A peculiar feature of microsporogenesis in *Asclepias*, as both Corry¹⁷ and Frye¹⁸ have ascertained, and as I also have observed in *A. curassavica*, *A. syriaca*, *A. verticillata*, and *A. viridis*, is for the archesporium to consist of numerous rather

¹³Corry, T. H. On the mode of development of the pollinium in *Asclepias Cornuti* Decaisne [*A. syriaca* L.]. Trans. Linn. Soc. London 2:75. 1883.

¹⁴Payer, J. B. loc. cit. 1857.

¹⁵Brongniart, A. T. Quelques observations sur la manière dont s'opère la fécondation dans les Asclépiadées. Ann. Sci. Nat. Ser. I, 24:263. 1831.

¹⁶Schleiden, M. J. Principles of scientific botany, ed. 3., p. 356. 1849.

¹⁷Corry, T. H. loc. cit. 1883.

¹⁸Frye, T. C. Development of the pollen in some Asclepiadaceae. Bot. Gaz. 59:325. 1901.

elongate prismic pollen mother cells in a rather oblique, radial, and very compact tissue, each cell approximately as long as the radial dimension of the anther locus (pl. 3, fig. 2). The cell walls separating the pollen mother cells are very thin, but never disengage from one another as is customary previous to reduction division in most other seed plants. Reduction division accomplishes the partition of the prismic pollen mother cell into a linear tetrad of pollen grains (pl. 3, figs. 3-4); neither do the walls of these disengage so that at maturity of the pollen the contents of the anther locus still is a solid tissue. When mature the pollen contains the usual two nuclei (pl. 3, fig. 5).

I have been particularly interested in the tapetum, which is unusually massive. Although not mentioned by either Corry or Frye, but perhaps schematically figured by the former for *A. syriaca*, the tapetum of the four species which I have investigated is divided tangentially into two very different tissues dorsal and ventral to the locus respectively (pl. 3, figs. 2, 6). The ventral or inner tissue, usually two or three cells deep, consists of cells rather typical for an angiospermous tapetum. The dorsal or outer tapetum, approximately six to twelve cells deep, consists of cells which are generally similar in outline to those of the ventral, and, like them, with one to three very prominent nuclei; but in addition they contain numerous lipid bodies which stain very prominently with safranin. Similar but more minute bodies are found in the cells secreting the translator apparatus (pl. 2, fig. 3). It was doubtless the secretion of the tapetum which Robert Brown saw and described as a "turbid fluid" within the loculi of the young anthers of *Asclepias syriaca*.

The tapetum persists for some time after the formation of the linear tetrad of pollen grains which, as we have already remarked, are not separated but continue to lie in a solid tissue—also at this time in direct contact with the tapetum. The thin walls, apparently cellulosic, have stained with fast green in my sections. While the mass of pollen grains is still in contact with the tapetum, however, the outer containing walls of the pollinium sac (for of course such it is) suddenly show a slight affinity for safranin, and the stain becomes more and more pronounced, not only in the outermost walls but progressively noticeable also in the walls within (pl. 3, fig. 4).

About the same time, also, the locus begins to expand and the tapetum to disorganize (the dorsal fatty tissue being last) until the pollinium sacs lie quite loose within the center of the locus (pl. 3, fig. 5). By this time their outermost wall has become very intensely stained with the safranin and it is several times thicker than when the affinity for safranin was first noticed. The interior walls stain more deeply and have become somewhat more thickened also, but not to such a marked degree as the outermost wall. It is now that the anther dehisces by its apical pores and that the translator arms unite with the tips of the pollinium sacs (pl. 2, fig. 6).

Judging from the prominent lipid bodies within the outer or dorsal tapetum, identical in their staining reaction to that of the pollinium sac membranes, I assume that it is the function of this tissue to secrete the required lipid substance which the walls of the tetrads absorb, while the function of the ventral or inner tapetum

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would appear to be purely nutritive. In any event, it is obvious that the tapetum contributes only its secretions to the pollinium sac membranes which are, in fact, the walls of the coherent tetrads of pollen grains. Each pollen grain, therefore, is enclosed within its own polygonal compartment of thickened walls from which, incidentally, it lies quite free. In addition to these common walls the individual pollen grain possesses only a very thin intine (pl. 3, fig. 5). This has led some to describe the pollen of Asclepiadeae as possessing but a single spore coat, which is true functionally if not ontogenetically.

The membranes of the pollinia, secreted as they are in three sections and by two distinct organs, the stigma and the anther, appear of closely similar, if not identical, chemical constitution when subjected to routine microchemical tests. They apparently are of some form of suberin, staining deep orange when treated with 40 per cent potassium hydroxide. When the potassium hydroxide is heated to boiling, irregular aggregates of minute grains (potassium phellonate) appear; these become reddish violet when treated with a drop of chloro-zinc-iodide (equal parts of saturated zinc chloride and zinc iodide).

Repetition of these tests with microtome sections, cut at 10 μ in order to investigate the chemical reactions of the lipid bodies of the tapetum, left much to be desired because of the macerating action of the potassium hydroxide and inability to clear the fragments of tissue. Definite orange discoloration of the tapetum was observed when treated with heated KOH. The suberin therefore appears to be secreted within the tapetum cells and later digested and translocated to the pollinium membranes.

POLLINATION:—

The entomophilous pollination of asclepiads provides one of the most fascinating chapters in biology, and one which many authors have loved to retell and to elaborate. Apparently Sprengel¹⁹, in 1793, was the first to observe the extraction of pollinia by insects, although he was ignorant of the true location of the stigmatic surface and entertained several erroneous impressions such as ascribing a trigger mechanism to the gland. Robert Brown²⁰, in 1831, correctly located the stigmatic surface at the tips of the chambers formed by the contiguous anther wings and described the germinated pollinia which he found within them. In 1865 Delpino²¹ published a detailed study to which little has been added since, although the subject has been treated variously by many subsequent authors including Charles Darwin.²² The most comprehensive review is that published in 1883 by Corry²³. Since I, myself, have nothing new to report, a very brief and generalized account will suffice here.

¹⁹Sprengel, C. K. *Das entdeckte Geheimniss der Natur im Bau und in der Befruchtung der Blumen.* p. 139. Berlin, 1793.

²⁰Brown, R. *On the organs and mode of fecundation in Orchideae and Asclepiadeae.* Trans. Linn. Soc. London 16:685. 1833.

²¹Delpino, F. *Relazione sull'apparecchio della fecondazione nelle Asclepiadee.* Torino, 1865.

²²Darwin, C. *The effects of cross and self-fertilization in the vegetable kingdom.* New York, 1877. (p. 375.)

²³Corry, T. H. *loc. cit.* 1883.

On bright sunny days a succession of many sorts of insects visit blooming plants of *Asclepias*, attracted by the showy flowers, their perfume, and particularly for the abundant nectar which is secreted by the hoods of their coronas. Prominent amongst these visitors are various Hymenoptera: the indigenous wasps and bees of the neighborhood.* Alighting upon an umbel of many flowers, each with five copious vessels of nectar, a bee or wasp will spend many minutes crawling or flying from one to the other and plunging its tongue greedily into each. As it sucks, it keeps up a characteristic movement of its barbed feet (pl. 1).

Delpino was able to observe, as a result of such movements, that a foot may by chance slide past the narrow space between the paired anther wings; and that if the motion continues to the top, a barb of the leg is virtually sure to wedge itself into the narrow vertical slit of the pollinium gland, attaching it almost inextricably. The wasps and bees, being strong insects, in dislodging their legs, easily pull the entire pollinium with its sacs of pollen from the broad apical pores of the anthers, and eventually fly on their way thus burdened. Weaker insects will perish in the trap or escape through loss of their limb.

Transfer of the pollinium sac to a stigmatic chamber is accomplished by the same casual movements of insects bearing the pollinia. Alighting upon a flower to

* Our most extensive enumeration of insect pollinators of *Asclepias* was compiled by Charles Robertson (Trans. Acad. Sci. St. Louis 5:569. 1891) over a period of 25 years. His data concerning seven species of *Asclepias* growing in the vicinity of Carlinville, Illinois, may be summarized as follows:

<i>Asclepias verticillata</i> :	Hymenoptera—27 genera, 38 species Diptera—11 genera, 13 species Lepidoptera—4 genera, 4 species
<i>Asclepias incarnata</i> :	Hymenoptera—21 genera, 41 species Diptera—10 genera, 15 species Lepidoptera—10 genera, 15 species Coleoptera—3 genera, 3 species Hemiptera—1 genus, 1 species
<i>Asclepias syriaca</i> :	Hymenoptera—13 genera, 14 species Diptera—10 genera, 11 species Lepidoptera—10 genera, 10 species Hemiptera—3 genera, 4 species Coleoptera—1 genus, 1 species
<i>Asclepias sullivantii</i> :	Hymenoptera—9 genera, 13 species Lepidoptera—4 genera, 4 species Coleoptera—1 genus, 1 species Diptera—1 genus, 1 species
<i>Asclepias purpurascens</i> :	Lepidoptera—4 genera, 5 species Hemiptera—1 genus, 1 species Hymenoptera—1 genus, 1 species Diptera—1 genus, 1 species
<i>Asclepias tuberosa</i> :	Lepidoptera—5 genera, 8 species Hymenoptera—5 genera, 6 species Diptera—1 genus, 1 species
<i>Asclepias birtella</i> :	Hymenoptera—7 genera, 8 species Coleoptera—1 genus, 1 species

As the insect slips the nectar, a burdened leg sooner or later will slip a pollinium sac up the narrow space between the two contiguous anther wings. The size and shape of the stigmatic chamber and the pollinium sac of a given species of asclepiads are close counterparts, and the sac, fitting snugly into its destined chamber, breaks from its suspending translator arm as the insect leg continues upward, and remains lodged in close proximity to the receptive surface.

Not only the legs but any barbed or hairy surface of the insect's body is capable of dislodging and holding the glands of pollinia. As a result of his investigations, Robertson found pollinia carried by the claws, hairs of the legs, thorax, abdomen, and tongue, pulvilli, and spurs of the tibia. Since such emergences vary widely in diameter, it follows that they are adapted to a wide range of pollinia as determined by the slit of the gland within which they must be inserted. A single insect, therefore, may be capable of carrying simultaneously the pollinia of several species of *Asclepias*, and, in fact, repeatedly has been observed to do so.

Anther wings of *Asclepias* usually are very closely applied face to face except at one or two places: the very base, where a small open space remains in the angle of the two closely abutting margins, and at special notches or spurs indenting the wings and characteristic of certain species. At these open places the pollinium sac is introduced at the tip where it is constricted into a thin elbow-like joint with the translator arm, and is threaded upward into the stigmatic chamber by the movement of the insect's body. The attached gland of the pollinium remains outside the chamber. This is a feat which seems impossible to employ in hand pollinations, but it is in fact quite simple and far safer than trying to pry the wings apart with needles.

The feat is aided, in insect pollination, by a curious rotation of the translator arms through approximately 90° , doubtless due to drying and shrinking of the delicate membrane during the insect's flight. This torsion brings the pollinium sacs, which lie with their flat faces approximately perpendicular to the plane of the anther wings while they are still within the anther, to adopt a new position nearly parallel with the anther wings, *i.e.* with their narrow margin placed to insert between the wings with least resistance.

Pollinium sacs of *Asclepias*, as has previously been noted, are rather asymmetrically pyriform in shape. This is to say that the compressed margins are unequally biconvex. It happens, as was first noted by Brongniart²⁴, that when pollen tubes are produced from the germinating pollinia they issue from one place only: invariably at the more salient margin. This margin, certainly without accident, is that which corresponds to the inner contour of the stigmatic chamber and the point from which the tubes issue is brought mechanically into contact with the receptive surface of the stigma. This also is an additional device for the insertion of the pollinium sacs; for the salient margin will be that more easily introduced between the anther wings. In hand pollinations, also, one must obey this rule, and

²⁴Brongniart, A. T. loc. cit. 1831.

pollinium sacs inserted improperly, although likely to germinate regardless, will fail to make adequate contact with the stigma and thus fail in fertilization.

The fact that in pollination the pollinium sac only is lodged within the stigmatic chamber, leaving the gland and its translator arms attached to the insect, has a very curious consequence at times: for the tip of a free translator arm, when drawn up between the anther wings, is the correct thickness to become wedged within the slit of another pollinium gland, thus extricating its suspended pollinium sacs. This process can be repeated to produce an astonishing more or less regularly dichotomous "multiple pollinium", as it is called (pl. 1, inset). Corry once found a multiple pollinium consisting of eleven units.

Robertson observes that the multiplication of pollinia upon an insect's legs may have very serious consequences for the European hive bee in particular. The bee, fettered by the glands and translator arms, is seriously handicapped in its occupation of gathering pollen and nectar, and its clumsy movements in the hive result in its expulsion and death. My friend Bernard C. Mikula has shown me a hive bee with its legs encumbered by 45 pollinium glands and their attached translator arms.

It has been noted previously that the stigmatic chambers within which the pollinium sacs are deposited actually are composed of the lateral margins of the anthers themselves except at the very tip where a small area of the true stigma is exposed. For this reason the term "alar chamber", employed by some students of asclepiads including Corry, may be more appropriate morphologically. I prefer "stigmatic chamber" since it seems to emphasize the function more directly. It is interesting to find that stigmatic chambers, when ready for reception of the pollinium sacs, are obviously filled with a fluid resembling the nectar of the corona hoods. This secretion, interestingly, is not so much contributed by the receptive surface as by the anthers themselves, which here produce a very prominent glandular epidermis (pl. 3, fig. 1).

Pollinium sacs, when lodged within an actively secreting stigmatic chamber, promptly begin to absorb the secrete and to swell. Within two or three hours the salient margin in contact with the receptive surface ruptures and the pollen tubes start to emerge. When in contact with the stigma the tubes penetrate very quickly; they do not disperse during their growth, but assume the form of a cable or skein quite easily seen by the naked eye upon dissection, even when obtained from herbarium specimens. The cable of pollen tubes passes intact through the stigma head and style to the cavity of the carpel, where it emerges and disperses over the surface of the placenta, each tube seeking an ovule.

FRUIT:—

The fruit of *Asclepias* (fig. 3) is a simple dry follicle dehiscing along its ventral suture. The shape varies from nearly linear to very broadly ovoid and from about 2 dm. to only 3–4 cm. in length. The pericarp may be glabrous or variously pubescent and frequently is beset with more or less prominent fleshy spines in such species as *A. syriaca*,²⁵ *A. speciosa*, and *A. fruticosa*. A peculiar feature of certain

²⁵ Further notes on variation in the pods of *A. syriaca* will be found in the taxonomic discussion of that species (p. 105).



Fig. 3. Types of fruit and seed of *Asclepias*: 1, *A. texana*, 2, *A. perennis*, 3, *A. subulata*, 4, *A. syriaca* (smooth fruit); 5, *A. syriaca* (spiny fruit).

fruits is the development of an inflated spongy endocarp which is particularly prominent in *A. viridis*, *A. asperula*, and the three species previously mentioned. This aerenchyma can best be observed in the fresh condition, since it collapses in desiccation; its function is quite problematic.

Although the two carpels of the gynoecium of *Asclepias* are equally developed at anthesis, it is exceedingly rare for both to develop fruit. One might suppose that the division of the receptive surface of the stigma amongst the five chambers might be a possible explanation since it is unusual for more than one or two chambers of a given flower to be pollinated successfully in nature. However, I have pollinated all five chambers of *A. curassavica* by hand, with the consequent production of solitary follicles. The cause, therefore, must be physiological rather than purely mechanical.

Similar physiological factors may be responsible for the surprisingly low ratio of fruit matured to the large number of flowers pollinated per plant. I have found that the species of the supposedly primitive series INCARNATAE, particularly *A. incarnata* itself, generally are the most fruitful, percentage-wise to the flowers per plant.

Many years ago I noted in various genera of the neighboring family Apocynaceae, where both carpels ordinarily mature fruit, that occasionally but one follicle develops or the pair may be more or less strongly unequal. This is particularly easy to observe in *Amsonia*. The converse situation in Asclepiadaceae may be a sequel to this trend, possibly destined to lead toward a monocarpellary gynoecium.

The hairs of the coma are smooth, extremely narrow, hollow tubes of practically pure cellulose, and possess astonishing buoyancy. The silky seed comas of species which grow in considerable colonies, such as *A. syriaca* and *A. incarnata*, were occasionally used as pillow stuffing by the early settlers. In World War II the U. S. Department of Agriculture undertook a rather extensive program to obtain large quantities of milkweed coma for the stuffing of life jackets; the program was conducted largely through the rural schools. The seed coma of *Calotropis*, a closely related genus, has been employed in paper making in southeastern Asia.

PHYLOGENY OF THE FRUIT:—

Phylogenetically, the most interesting aspect of the fruit of *Asclepias* is not the follicle itself but the accrescent pedicel which supports it. By far the greatest number of species of the tribe Asclepiadeae possess a most peculiar fruiting pedicel which, during its accrescence after pollination, produces a variable sigmoid curve; the follicle itself habitually is erect on such a pedicel, and is described in this text as "erect on deflexed pedicels." In other Asclepiadaceae the pedicels either are completely declinate, with the follicle pendulous, or erect with the follicle also erect.

In the genus *Asclepias*, although the greatest number of species produce follicles erect on deflexed pedicels as is characteristic of the tribe, a comparatively small number produce follicles erect on erect pedicels and still fewer with pendulous follicles as is customary for the family Asclepiadaceae generally. One might suppose the erect or pendulous fruiting pedicels to be a "primitive" character for the genus and the deflexed pedicels correspondingly "advanced."

In systematic studies of this sort, it obviously is highly desirable to correlate flowering and fruiting characters. I have striven to do so in *Asclepias*, although

with only partial success. But the fact of evolution is demonstrated most clearly by the lack of complete correlation of characters in our systematic categories.

In the system for the North American species of *Asclepias* which is proposed here, the construction of the subgenera and series is made wholly on floral characters. This is necessary because of the many species involved and the great conservatism of the fruit. Since the fruit is so highly conservative, however, it provides a more reassuring guide, such as it is, to the phylogeny of the highly variable floral organs than would otherwise obtain.

It is probably reasonable to suppose that the follicles, erect on deflexed pedicels, are "advanced" phylogenetically since they are so unique to the tribe Asclepiadeae. Therefore those species of *Asclepias* having erect or pendulous fruiting pedicels, characteristic of the family Asclepiadaceae otherwise, might be considered "primitive." Upon these premises, the subgenus ASCLEPIAS might be considered as the most primitive not only from floral characters but from the fruit as well, since approximately one quarter of its species produce fruit with erect or pendulous pedicels; series INCARNATAE, considered the most primitive from floral structure, includes no species with deflexed fruiting pedicels and erect follicles.

Erect or pendulous fruiting pedicels are scattered throughout other subgenera as well as in other series of subgenus ASCLEPIAS, however; these species include *A. quadrifolia*, *A. viridula*, *A. pellucida*, and *A. pringlei* of ASCLEPIAS-SYRIACAE, *A. michauxii* of ASCLEPIAS-PURPURASCENTES, *A. labriiformis*, *A. subaphylla*, *A. albicans*, and *A. masonii* of ASCLEPIAS-ROSEAE, *A. cinerea*, *A. feayi*, and *A. cutleri* of ASCLEPIODELLA, *A. stenophylla* of POLYOTUS, and *A. subulata* of PODOSTEMMA. In most instances, these species might well be considered "primitive" within their respective series and subgenera from the standpoint of floral morphology.

EVOLUTION

The elaborate pollinating devices of Asclepiadaceae might appear so exceptional amongst the Flowering Plants as to preclude direct comparison with any other family. However, Demeter²⁶ has succeeded in it by emphasizing certain undoubtedly significant trends in the neighboring Apocynaceae, also an entomophilous family. There the stigma head, which is far more variable in form than in Asclepiadaceae, also possesses an inferior stigmatic surface as a rule; there also the stigma produces a second secretion, which in this case is merely fluid and amorphous but of a consistency to facilitate transference of the granular pollen to the proboscides of visiting insects. Demeter probably is correct in interpreting the far more precise and specific translator apparatus of asclepiads as having arisen from such lower levels of organization; but I, and probably most other systematists, would not follow him in the consolidation of the two families in conclusion.

Although organs as highly developed as the corona of most Asclepiadaceae are not found amongst Apocynaceae, undoubtedly related structures exist in the more

²⁶Demeter, K. Vergleichende Asclepiadeenstudien. Flora n. s. 15:130. 1922.

or less conspicuous appendages of the staminal filaments of *Vallaris* and *Forsteronia* subgen. *PTERANTHERA*. In Apocynaceae nectar is provided by gynoeceal disc structures, carpellodial in nature,²⁷ rather than by the staminal corona as in Asclepiadaceae. The diverse natures of the nectar-secreting organs serve to emphasize the systematic independence of the two families.

Schmalhausen's²⁸ principle of the evolutionary adaptation of animals according to their position in a hierarchy of nutrition has been supplemented by Stebbins,²⁹ who has proposed an adaptational classification of plants and of organs of plants according to three levels in a hierarchy of reproduction. According to Stebbins, the lowest level, in which evolutionary modification is slowest, includes those organisms and organs which rely solely upon a large number of gametes and zygotes and dissemination of them by air or water for the maintenance of their kind; the highest level, in which evolution is most rapid and diversification most extreme, includes particularly those plants with fewer diaspores, or their organs, which rely upon animals for pollination, seed dispersal, or both. Explaining this important truism by another, Stebbins concludes that "Since there are so many more diverse kinds of animals in any locality than there are different climatic or edaphic conditions, many more adaptive gene combinations are possible in plants which rely on animals for their vital reproductive functions."

Both the lowest and the highest of Stebbins' reproductive levels, and their ability to coexist within a single organism, are exemplified by the Asclepiadaceae with their conservative fruits and wind-borne seeds and their tremendously plastic entomophilous stamens. Speciation of *Asclepias* in North America having preoccupied my attention for a number of years past, I still am unable to identify more than fragments of the mechanisms which may be involved.

The genus *Asclepias* in North America, including the Antilles, consists of 108 species which have been distributed amongst nine subgenera. There is a noticeable, if irregular, tendency for the subgenera to decrease in number of species proportional to their supposed phyletic distance from the hypothetical ancestral plexus, subgenus *ASCLEPIAS*, which is by far the richest in species. Subgenus *ASCLEPIAS*, in turn, is subdivided into nine series amongst which there also is a tendency to diminish in number of species phyletically outward from the supposedly primitive series *INCARNATAE*.

An even more significant phenomenon, and one less likely either to individual subjectivity or to distortion by the linear sequence of pages, may quickly be perceived by an inspection of the flower drawings of each species provided in the taxonomic section which follows. Even a non-botanist can grasp the progressive compounding of floral complexity. What are the causes of the intricate canalization? Entomophily, alone, is an unsatisfying generality.

²⁷Woodson, R. E., Jr., and J. A. Moore. The vascular anatomy and comparative morphology of apocynaceous flowers. *Bull. Torrey Bot. Club* 65:135. 1938.

²⁸Schmalhausen, I. I. *Factors of evolution: the theory of stabilizing selection*. Philadelphia, 1946.

²⁹Stebbins, G. L., Jr. *Rates of evolution in plants*. *Genetics, Paleontology, and Evolution*. p. 229. Princeton University Press, 1949.

R. J. Moore,³⁰ in a cytogenetic study of several North American species of *Asclepias*, found all to be isoploid ($n = 11$), with the chromosomes small and relatively uniform in configuration, although those of *A. curassavica* were noticeably smaller than the rest (which may support our impression that that species is not indigenous to North America). He also attempted various artificial hybridizations involving six species, all without success. To Moore's list of unsuccessful pollinations I can add the following:

- curassavica* × *quadrifolia*, and reciprocal
curassavica × *purpurascens*
 **fascicularis* × *verticillata*, and *reciprocal
 **fascicularis* × *incarnata*
 **verticillata* × *incarnata*
angustifolia × *curassavica*
 **angustifolia* × *verticillata*

Ten flowers were pollinated for each. Those preceded by an asterisk were followed by production of small fruit which failed to mature. I was surprised and rather disappointed that those of the list asterisked failed to mature fruit; for all are apparently closely allied species of my "primitive" series INCARNATAE.

O. A. Stevens³¹ reports successful artificial hybrids of *A. speciosa* × *A. syriaca* after many attempts, and several botanists have collected supposed natural hybrids of the same species. I have seen several herbarium specimens supporting these reports. Aside from these, I do not believe that I have encountered many more than a dozen plants that I would construe as interspecific hybrids amongst the thousands of specimens of the 73 species of the United States that I have examined, either in the herbarium or in the field. The incidence appears to be only slightly higher in Mexico.

A list of apparently interspecific hybrids which I have examined in the herbarium, and their distribution amongst the subgenera and series of this revision follows. Some items are rather indefinite and open to interpretations other than hybridity.

pumila × *verticillata* (both species ASCLEPIAS-INCARNATAE)

Plants branching copiously toward the crown, rather as in *pumila*; leaves linear, broader and longer than normally in either species, irregularly opposite, spiral, or ternate, with internodes longer than in either species; corona hoods entire.—Leeds, North Dakota, July 20, 1913.

J. Lunell (MO).

coulteri × *quinquedentata* (both species ASCLEPIAS-EXALTATAE)

Discussed in the taxonomic section under *A. coulteri*.

amplexicaulis × *humistrata* (ASCLEPIAS-EXALTATAE; ASCLEPIAS-SYRIACAE)

Plants simulating *amplexicaulis*, but less erect and with tendency to lateral, more shortly pedunculate inflorescences in the upper leaf axils; flowers with shorter columns and shorter, less cylindrical hoods than in *amplexicaulis*.—Aspalaga, Florida, May, 1898, A. W. Chapman (MO).

³⁰ Moore, R. J. Investigations on rubber-bearing plants. IV. Cytogenetic studies in *Asclepias* (Tourn.) L. Canad. Jour. Res. 24C:66. 1946.

³¹ Stevens, O. A. The cultivation of milkweed. N. Dak. Agr. Exp. Sta. Tech. Bull. 333. 1945.

amplexicaulis × *syriaca* (ASCLEPIAS-EXALTATAE; ASCLEPIAS-SYRIACAE)

Plants probably involving such hybridization have been described by Miss Vail as follows:

Asclepias bicknellii Vail, in Bull. Torrey Bot. Club 31:458. pl. 19. 1904. Leaves crisped as in *amplexicaulis*; flowers intermediate, with shorter column than in *amplexicaulis*, hoods truncate and slightly erose as in *amplexicaulis*, but of thinner texture as in *syriaca*.—Van Cortlandt Park, New York City, June 25, 1895, E. P. Bicknell (NY).

Asclepias intermedia Vail, loc. cit. 459. pl. 16. 1904. Leaves pubescent as in *syriaca* but somewhat crisped as in *amplexicaulis*, umbels shortly pedunculate as in *syriaca*; flowers intermediate but somewhat more like *syriaca* (slightly longer column, more sharply ascending and larger hoods). Lawrence, Long Island, July 17, 1904, E. P. Bicknell (NY).

syriaca × *viridiflora* (ASCLEPIAS-SYRIACAE; ACERATES)

Plants pubescent, with leaves rather small for *syriaca*; inflorescence solitary, subterminal; flowers strikingly intermediate, of intermediate size, column nearly obsolete, hoods nearly erect, narrow, somewhat saccate at the base, slightly longer than the anther head, with inconspicuous marginal auricles, no horn; pollinia intermediate, conspicuously attenuate.—Long Point, Lake Maxinkuckee, Marshall County, Indiana, August 26, 1926, J. R. Churchill (MO).

speciosa × *syriaca* (ASCLEPIAS-PURPURASCENTES; ASCLEPIAS-SYRIACAE)

The general habit of both putative parents is closely similar; flowers of the putative hybrids are intermediate in size and degree of attenuation of the hoods. This hybrid has been created experimentally by O. A. Stevens, and is encountered in the field in northwestern Iowa and adjacent Minnesota and North Dakota.—Ruthven, Iowa, July 26, 1943, A. Hayden 3145 (MO).

lanuginosa × *pringlei* (ASCLEPIAS-PURPURASCENTES; ASCLEPIAS-SYRIACAE)

Discussed in the taxonomic section under *A. lanuginosa*.

emoryi × *oenotheroides* (both species PODOSTEMMA)

Discussed in the taxonomic section under *A. emoryi*.

elata × *glaucescens* (ASCLEPIODORA; ASCLEPIAS-GRANDIFLORAE)

Discussed in the taxonomic section under *A. elata*.

This list is remarkably meagre considering the size of the genus *Asclepias* in North America, in contrast to my previous experience with the systematics of Flowering Plants. Although more extensive cytogenetic evidence certainly is necessary, I believe it probable that neither polyploidy nor hybridization has played a significant part in the speciation of *Asclepias* in this area.

The pollinating apparatus of asclepiads is so elegantly contrived that it has been only natural to ascribe to it the relative purity of their species. It has been quoted widely as one of the most outstanding examples of mechanical isolation in plants, and I myself have held this view. More recently the evidence for this assumption has seemed less compelling to me.

One is apt to associate constancy with such structural intricacy as one sees in the flowers of *Asclepias*. Nevertheless, considerable variation is found, and one must not consider the flower drawings accompanying this revision, for example, as inviolable patterns from which all individuals of a species are cast. I have gathered statistical data for such variation with respect to only two structures of a single species, *A. tuberosa*, where the hood length has the astonishingly wide colonial range in values for *V* of 0.4 to 6.6 in Iowa and Minnesota, the data obtained from local population samples. Pooled measurements of the pollinium sac length of the same species in its midwestern range, obtained from herbarium specimens, yielded a value for *V* of 1.7.

Such variability as that of pollinium sac length bespeaks the probability of similar variability in the dimensions of the stigmatic chamber and casts doubt on the lock-and-key simile which has been coined for the pollinating apparatus of *Asclepias*. Surely such a large pollinium sac as that of *A. erosa* could scarcely be

accommodated within the far smaller stigmatic chamber of *A. fascicularis*, for example; yet my friend Dr. R. W. Holm informs me that he has found the smaller pollinium sacs of *A. fascicularis* lodged and germinated within the larger stigmatic chambers of *A. erosa*.

Both R. J. Moore³² and I have found all species which we have pollinated to be self-sterile. Plotnikova³³ and O. A. Stevens³⁴ have reported *A. syriaca* to be capable of self-pollination, but Moore, who has made a thorough investigation of the claim, considers it unlikely; similarly, Fischer³⁵ asserts that *A. incarnata* may be self-fertile, but that has not been my experience. It should be possible, therefore, to place single potted plants of *Asclepias* side by side, removed from other plants of the same species and available to insect pollinators, in order to observe whether pollinia of one are able to be lodged within the stigmatic chambers of the other through natural means. I have done this with potted plants of *A. fascicularis* and *A. verticillata*, and small abortive pods have been produced similar to those obtained through artificial cross pollination. The barriers separating these species apparently are physiological and not mechanical.

Nor are the insect pollinators limited to certain species of *Asclepias*, exclusive of physical strength to withdraw the larger pollinia. The extensive observations of Robertson,³⁶ already quoted, have shown numerous genera and orders of insects transporting the pollinia of a given asclepiad, as well as the transportation simultaneously of pollinia from diverse asclepiads by the same pollinator.

I am more inclined to view the physiological barriers as primary in maintaining the genetic purity of the species of *Asclepias*. Equally, after their origin through mutation, physiological barriers might construct a reservoir damming the flow of genes affecting various structures and launching a new morphological species in time, natural selection permitting. Mechanical isolation of numerous asclepiad species there doubtless is, but I feel that it is secondary and the product of the primary processes of physiological isolation and mutation.

Could not such a mechanism of speciation which is envisioned produce the gradually diverging floral innovations at which we marvel? It appears to me quite more than likely that the series, and perhaps even the subgenera, of this revision are unnatural in the sense of common horizontal levels of development attained more or less fortuitously by species of independent radiating lines of descent. Is this not suggested by our list of putative hybrids, in which species of different series or even subgenera are so frequently involved? The lines themselves are too subtle for description or even for perception, and one must satisfy himself with analogies.

³²Moore, R. J. loc. cit. 1946.

³³Plotnikova, T. An experiment in self-pollination of *Asclepias cornuti*. Ukraine Acad. Sci., Inst. Bot. Jour. No. 26-27:127. (English summary).

³⁴Stevens, O. A. loc. cit. 1945.

³⁵Fischer, E. Der Anbau einer Faser- und Bienenfutterpflanze. Pflanzenbau 17:212. 1941.

³⁶Robertson, C. Notes on the mode of pollination of *Asclepias*. Bot. Gaz. 11:262. 1886; Insect relations of certain Asclepiads. I. Bot. Gaz. 12:207. 1887; II. loc. cit. 244. 1887; Flowers and insects, Asclepiadaceae to Scrophulariaceae. Trans. Acad. Sci. St. Louis 5:569. 1891.

The North American species of *Asclepias* form a coherent alliance amongst themselves quite independent of those indigenous either to Africa or to South America. The three centers appear merely as individual segments of the radiating phylogeny to which I have alluded. It is obvious that both the African and the South American segments include in part much the same type of floral modification as that which I include within my subgenus *ASCLEPIAS* series *INCARNATAE* and which I construe to be the primitive element in North America. The South American, with its few species, has not progressed far beyond this supposedly primitive level of modification. The African, however, has spread into quite as labyrinthine paths of floral diversification as has the North American and frequently with closely parallel development. But I cannot share the recent view of Bullock³⁷ that the name *Asclepias* must be confined to America. All that one may say, I believe, is that the American species usually have a horn accompanying the corona hoods and the African do not. That species groups of a genus have been separated for ages and so have developed independently of necessity entitles them no more to rank as individual genera than would be the case with similarly isolated species.

SYSTEMATIC LEVELS:—

I have discussed my reasons for adopting an ultra-conservative interpretation of the genus *Asclepias* in the first paper³⁸ of this series. Chief amongst these is the nearly continuous variation of the floral characters which have been used as the basis for generic segregations. This will be perceived readily in the drawings which accompany the taxonomic section which follows, and is reflected by the divergent treatment of genera, even from nearly identical areas, in such standard and strictly contemporaneous works as the second edition of Britton and Brown's 'Illustrated Flora'³⁹ and the eighth edition of 'Gray's Manual'.⁴⁰

The subgenera as employed here, follow in general the amplified boundaries of several of the segregate genera of floristic manuals, although a few have had to be suppressed completely largely for the sake of intelligibility in the keys; a few previously neglected segregate genera, such as Nuttall's *Polyotus* and Greene's *Podostemma*, have been revived to the degree of subgenera for reasons of systematic balance. The several series of the subgenus *ASCLEPIAS* reflect the considerable variation of this large assemblage of species. As discussed previously, I believe them to be "horizontal" sequences phylogenetically, at least in part, in the sense of being common levels of modification attained perhaps independently by several parallel lines of evolutionary development—and unnatural to that extent. Series *INCARNATAE*, however, I consider to be "natural", or more nearly so, in the usual sense of the term.

³⁷ Bullock, A. A. Notes on African Asclepiadaceae, I. Kew Bull. 1952:426. 1952.

³⁸ Woodson, R. E., Jr. The North American Asclepiadaceae, I. Perspective of the genera. Ann. Missouri Bot. Gard. 28:193. 1941.

³⁹ Gleason, H. A. The new Britton and Brown illustrated flora. vol. 3, p. 73. Lancaster, Penn., 1952.

⁴⁰ Fernald, M. L. Gray's manual of botany, ed. 8. p. 1169. New York, etc., 1950.

Species are the most fundamental of systematic populations. It thus appears only just to require of them a definite morphological character in addition to genetic cohesion. Every systematist knows that no two species, even of a single genus, are exactly equivalent either in the sum of their morphological characters or in their variability, although that is the ideal toward which our methods aspire. The ideal is practical in so far as it is pursued conscientiously and its limitations are recognized.

In this treatment, the species of *Asclepias* are of quite unequal value morphologically. As has been intimated previously, the species of the supposedly primitive series INCARNATAE of subgenus ASCLEPIAS are scarcely distinguishable upon the basis of floral structure; the differences are based upon vegetative characters and fruit as a rule. In the higher series and subgenera, on the other hand, species differences are mostly floral and increase rather constantly in complexity to the most advanced subgenera.

The pronounced physiological and mechanical barriers between the North American species of *Asclepias* are an invaluable aid in the definition of the species as a systematic unit. Interspecific hybrids, as has been discussed previously, are either unknown or of more or less sporadic occurrence. Geographically distinguished races of some definite morphological character which are connected by obvious clines of apparently heterozygous populations are classified as subspecies. The genocline is the distinguishing criterion. Here again the subspecies are of unequal morphological value. Such subspecies as those of *A. incarnata* and *A. tuberosa*, being of relatively "primitive" series, are distinguished upon chiefly vegetative characters, while others of more "advanced" series, such as *A. cryptoceras* and *A. californica*, are characterized by floral structures which might be considered as of specific value in the absence of evidence of a genocline.

Although subspecies are allopatric by definition, an apparent exception is found in *A. tuberosa* ssp. *interior* and *terminalis*, a preliminary study of which has been published in another journal.⁴¹

In a few species more or less pronounced variation of various organs, such as the leaves in *A. viridifolia*, display no geographic or ecological pattern. These frequently have been made the basis of "varieties" in the past. In this treatment such variation is suspected as evidence of neutral polymorphism and is ignored systematically.

GEOGRAPHY

The species of the inclusive genus *Asclepias* are distributed amongst three centers of dispersal: temperate to tropical North America, subtropical South America, and southern and eastern Africa. Of these, the North American and the African are by far the largest, including over a hundred species apiece. The South American, notably isolated by approximately 3,000 miles from the larger center to the

⁴¹ Woodson, R. E., Jr. Biometric evidence of natural selection in *Asclepias tuberosa*. Proc. Nat. Acad. Sci. 39:74. 1953.

north, appears to consist of less than a dozen poorly differentiated species. None is indigenous to more than one of these centers; but the American *A. curassavica* is widespread in the tropics and subtropics of both hemispheres as an escape from cultivation, and the African *A. fruticosa* appears sporadically as a waif in tropical America, Hawaii, and perhaps elsewhere.

The North American species of *Asclepias* are adapted to a wide range of environment. Being essentially subtropical plants, their altitudinal and latitudinal preferences are somewhat restricted; few extend to elevations over 2,000 meters, and only few cross the southern borders of the Canadian provinces. The individual species actually are rather narrow in their ecologic preference, and only *A. syriaca*, *A. curassavica*, and *A. fasciculata* (and possibly *A. incarnata*) can be classified as weeds. Most species prefer rather open dryish woods, glades, barrens, and plains.

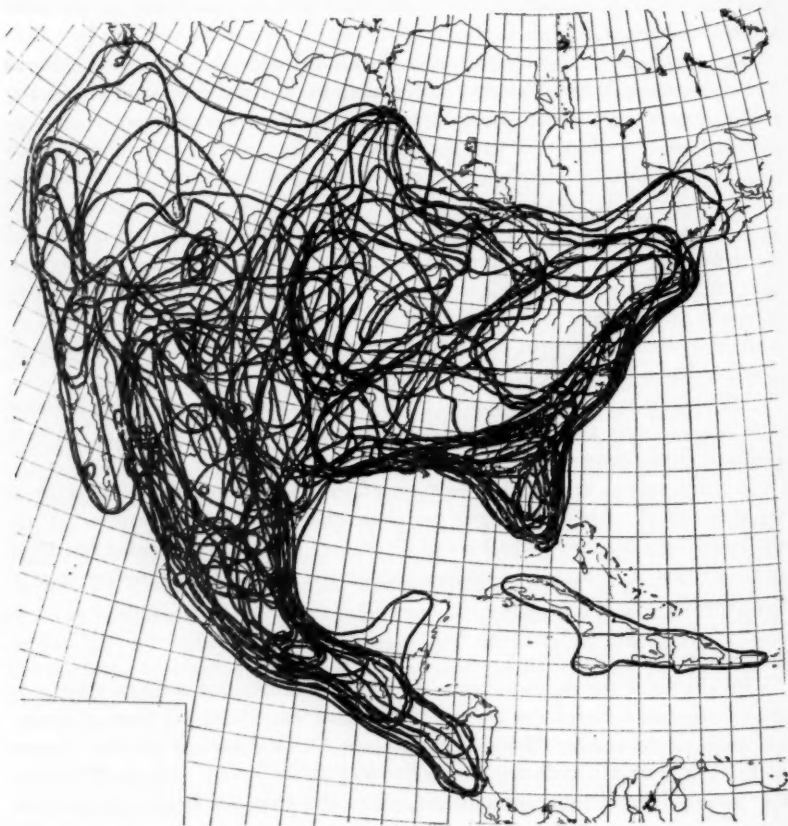


Fig. 4. Composite distribution map of 106 indigenous North American species of *Asclepias*. Explanation in the text.

Several desert species are found in the southwestern United States and adjacent Mexico and these frequently adopt strikingly similar twiggy, *Ephedra*-like habits with narrow fugaceous foliage. Only *A. perennis* and *A. incarnata* are subaquatics; *A. i. pulchra* is outstanding in its tolerance of more or less brackish water.

If the distribution maps provided for each of the 106 indigenous species in the taxonomic section which follows are generalized as closed loops and drawn upon a single map of North America, the resulting confusion well depicts the complexity of the geography of *Asclepias* upon this continent. However, it appears to me that six vortices or centers of concentration may be distinguished (fig. 4) which I call, from southeast to west, the Antillean, the Floridian, the Appalachian, the Ozarkian, the Mexican, and the Californian.

I have assigned the indigenous species of *Asclepias* to one (sometimes to two or three) of the six centers of concentration as indicated in Table I. Vicarious subspecies of a common species are tabulated in the same manner as for species, and the waifs, *A. curassavica* and *A. fruticosa*, are eliminated completely.

Many loops necessarily converge at the coast line (and unfortunately beyond!), but more significant from our standpoint are the convergences within the continent, since these indicate the complementary bounds of the species: they are similar to the lines upon a contour map. It is obvious that relatively few distributions of any center (the Antillean consists of but one!) are exactly equiformal, but the centers possess reality none the less in the sense of statistical tendencies. Discussion of a few distributions chosen from the eastern United States will illustrate not only the method of compilation but also certain important factors in the distribution of *Asclepias* in this area and in general.

Asclepias tuberosa, which consists of four subspecies, may form the basis of discussion since more is known of its geography than of any other species.^{42, 43} The distribution of this species is illustrated by the upper left panel of fig. 5. The four subspecies are distinguished chiefly on leaf shape which, while relatively constant within the respective centers of distribution, intergrade at the juncture of the ranges with so greatly increased accompanying variation as to be clearly indicative of hybridization.

As I have pointed out in an earlier discussion of the distribution of *Asclepias* in the eastern United States,⁴⁴ the areas occupied by the subspecies of *A. tuberosa* correspond closely to three well-known floristic and paleogeographic regions, namely, Appalachia, Ozarkia, and the Floridian "Orange Island"; and the familiar geographic isolation of the three, determined by incursions of the sea and glaciation in the Cretaceous and the Cenozoic times, might logically be assumed as contributory to the evolution of their respective subspecies. It will be noticed, however,

⁴²Woodson, R. E., Jr. Some dynamics of leaf variation in *Asclepias tuberosa*. Ann. Missouri Bot. Gard. 34:353. 1947.

⁴³Woodson, R. E., Jr. Biometric evidence of natural selection in *Asclepias tuberosa*. Proc. Nat. Acad. Sci. 39:74. 1953.

⁴⁴Woodson, R. E., Jr. Notes on the "historical factor" in plant geography. Contr. Gray Herb. Harvard Univ. 165:12. 1947.

TABLE I
THE INDIGENOUS NORTH AMERICAN SPECIES OF *ASCLEPIAS* CORRELATED
SYSTEMATICALLY WITH REGARD TO THE SIX GEOGRAPHICAL CENTERS OF
CONCENTRATION. EXPLANATION IN THE TEXT.

Subgenera and Series	Appalachian	Ozarkian	Floridian	Mexican	Californian	Antilles
ASCLEPIAS INCARNATAE	1b <i>incarnata</i> <i>pulchra</i> 3 <i>perennis</i>	1a <i>incarnata</i> <i>incarnata</i>		2 <i>texana</i> 4 <i>woodsoniana</i> 5 <i>linearis</i> 6 <i>pseudorubri-</i> <i>caulis</i> 9 <i>angustifolia</i> 11 <i>subverticil-</i> <i>lata</i> 12 <i>mexicana</i> 15 <i>leptopus</i> 16 <i>gentryi</i>	10 <i>fascicularis</i>	8 <i>niva</i>
	13 <i>verticillata</i>	13 <i>verticillata</i> 14 <i>pumila</i>	13 <i>verticillata</i>			
	17a <i>tuberosa</i> <i>tuberosa</i>	17c <i>tuberosa</i> <i>interior</i> 17d <i>tuberosa</i> <i>terminalis</i>	17b <i>tuberosa</i> <i>rolfsii</i>			
	18 <i>rubra</i>		19 <i>lanceolata</i>			
	23 <i>exaltata</i>			20 <i>ovata</i> 21 <i>similis</i> 22 <i>contrayerba</i>		
	26 <i>amplexicaulis</i>	26 <i>amplexicaulis</i>		24 <i>coulteri</i> 25 <i>quinqueden-</i> <i>tata</i> 27 <i>virlettii</i> 28 <i>scaposa</i>		
ASCLEPIAS EXALTATAE				29 <i>crocea</i> 30 <i>grandiflora</i> 31 <i>glaucescens</i>		
ASCLEPIAS GRANDIFLORAE	32 <i>quadrifolia</i>	32 <i>quadrifolia</i>	33 <i>viridula</i>	34 <i>pellucida</i>		
ASCLEPIAS SYRIACAE	36 <i>syriaca</i>	35 <i>ovalifolia</i> 36 <i>syriaca</i> 38 <i>meadii</i>	37 <i>humistrata</i>	39 <i>hypoleuca</i> 40 <i>pringlei</i> 41 <i>pratensis</i> 42 <i>linaria</i>		
ASCLEPIAS PURPURASCENTES	44 <i>variegata</i> 45 <i>purpurascens</i>	43 <i>sullivantii</i> 45 <i>purpurascens</i>	48 <i>curtissii</i>	46 <i>ballii</i> 47 <i>lanuginosa</i> 49 <i>speciosa</i> 50 <i>euphorbiae-</i> <i>folia</i>		

TABLE I (Continued)

Antilles	ASCLEPIAS	MACROTIDES		51 <i>micbauxii</i>	52 <i>conzattii</i> 53 <i>involuta</i> 54 <i>macrosperma</i> 55 <i>puberula</i> 56 <i>macrodis</i> 57 <i>lemmonii</i> 58 <i>laxiflora</i>	
				59 <i>tomentosa</i>	60 <i>arenaria</i> 61 <i>latifolia</i>	
8 nivea	ASCLEPIAS	ROSEAE		62 <i>obovata</i>	63 <i>labriformis</i> 67 <i>subaphylla</i> 70 <i>nummularia</i> 71 <i>roscia</i> 73 <i>auriculata</i> 75 <i>nyctaginifolia</i> 76 <i>oenotheroides</i> 77 <i>emoryi</i> 78 <i>standleyi</i>	64 <i>erosa</i> 65 <i>eriocarpa</i> 65 <i>masonii</i> 68 <i>albicans</i> 69 <i>vestita</i>
						74 <i>subulata</i>
		PODOSTEMMA				
		ANANTHERIX		79 <i>connivens</i>		
		ASCLEPIODELLA		80 <i>cinerea</i> 81 <i>frayii</i>	82 <i>brachystephana</i> 83 <i>rutbiae</i> 84 <i>cutleri</i> 85 <i>uncialis</i>	
						86 <i>cordifolia</i>
		ACERATES	90 <i>viridiflora</i>	88 <i>hirtella</i> 90 <i>viridiflora</i> 91 <i>nuttalliana</i>	89 <i>longifolia</i>	
		SOLANOA			93 <i>cryptoceras</i>	92 <i>californica</i> 94 <i>solanoana</i>
		POLYOTUS		95 <i>stenophylla</i>	96 <i>rusbyi</i> 97 <i>engelmanniana</i>	
		ASCLEPIODORA			98 <i>elata</i> 99 <i>mirifica</i> 100 <i>fournieri</i> 101 <i>zanthodacryon</i> 102 <i>sperryi</i>	
			103 <i>viridis</i>	103 <i>viridis</i>	103 <i>viridis</i>	
		PODOSTIGMA		107 <i>pedicellata</i>	104 <i>asperula</i> 105 <i>circinalis</i> 106 <i>atroviolacea</i>	

that not one, but two subspecies of *A. tuberosa* are classified as Ozarkian, namely, *terminalis* and *interior*. The anomaly of the distributions of these is the obvious fact that they are concentric to one another throughout their vast ranges: *interior* occupies a central core with a diameter roughly equivalent to the distance from southern Michigan to central Texas, and *terminalis* a concentric peripheral arc from southern Ontario to Sonora. Rather extensive biometric studies⁴⁵ which are not yet complete strongly imply that both subspecies have had their origin in the Ozark plateau, *terminalis* being the older, and that *interior*, a more recent genetic innovation within the former, is in the process of diffusing through the range of the parent subspecies and of supplanting it by virtue of certain traits (viz. increased reproductive potential, greater vegetative vigor) of obvious selective superiority.

It is demonstrable biometrically⁴⁶ that the diffusion of ssp. *interior* into glaciated and unglaciated areas has been remarkably symmetrical. It appears justified, therefore, to conclude that the origin of *interior* must date long since the retreat of Wisconsin glaciation in late Pleistocene, since *terminalis* has preceded it into glaciated territory.

Origin through spatial isolation has become such a keystone to the definition of subspecies that the theory of the sympatric origin of subspecies *terminalis* and *interior* doubtless will not be acceptable to some present-day evolutionists. On the other hand, I doubt that many would deny the transformation of populations *in situ*, since such an attractive theory as that of Sewall Wright's genetic drift is implicit in it and since the alternative would impute a rigidity of populations in space and time which would generally be recognized as erroneous. I am not personally familiar with more compelling evidence amongst plants of the gradual genetic transformation of populations through mutation and natural selection essential to the modern doctrine of evolution, nor upon a grander scale than that afforded by *A. tuberosa* ssp. *terminalis* and *interior*. To withhold systematic recognition to two such contending populations would defeat both of the primary functions of systematics: precision of reference and phylogenetic depiction.

Fortunately, no apologies are necessary for subspecies *tuberosa* and *rolfsii*, which clearly are allopatric. However, the approximate dating of *tuberosa*, *terminalis*, and *rolfsii* is more difficult than for *interior*. It is familiar knowledge that the Appalachian and Ozark plateaus have been available continuously for colonization by land plants since Paleozoic. Since Late Mesozoic, when angiosperms attained their ascendancy, Appalachia and Ozarkia have been separated to the south by the Mississippi embayment of the Cretaceous seas and later by the delta sediments deposited in it. During the extensive glaciation of early Pleistocene, Appalachia and Ozarkia were disjunct from the north while still separated from the south ecologically, at least as far as non-alluvial plants are concerned (which includes by far the majority of asclepiads). Within these disjunct areas *A. t. tuberosa* and

⁴⁵ Woodson, R. E., Jr. loc. cit. 1953.

⁴⁶ Woodson, R. E., Jr. Some dynamics of leaf variation in *Asclepias tuberosa*. Ann. Missouri Bot. Gard. 34:353. 1947.

terminalis may well have had their inception. Similarly, the less familiar fluctuating Floridian archipelago known as "Orange Island",^{47, 48} for which there is stratigraphic evidence since the Cretaceous, may be considered a possible refugium for *ssp. rolfsii* with considerable justification.

Although it surely would not be justified to conclude that *A. tuberosa* existed in Cretaceous in exactly the form as it is known today, it appeals to me entirely defensible to conclude a common ancestor of our four present-day subspecies, and of not too different form. Perhaps Miocene would serve as a rough approximation of the time of their divergence as subspecies.

Finally, it appears to me significant that the obviously youngest subspecies of *A. tuberosa*, *ssp. interior*, can safely be considered as having arisen in the ancestral refugium of Ozarkia, in spite of the wide range of climatic and edaphic conditions offered by the vast distribution of the parent subspecies *terminalis*. That this is a general phenomenon in *Asclepias* is attested by the tendency of the species distributions, as shown in fig. 4, to converge over the six centers of concentration to which attention was drawn in previous paragraphs. I hold the opinion that this tendency is the direct product of the age of the refugium and the mutation rate of the populations concerned: that, in general, the longer an area is inhabited by a population, the greater the opportunity for favorable mutations to arise within it. This of course has nothing to do with the varying opportunities for adaptive radiation offered by the nature of the refugium.

While I hold the foregoing historical factor to be primary in interpreting the distribution of *Asclepias* in eastern North America, the role of adaptation to environment is closely involved as well. The ecologic complex of a refugium may gradually change to the disadvantage of an inhabiting population to the end that the latter may be obliged to shift its distribution to one more favorable, if available through its instruments of dispersal; or, failing that, may decline and be supplanted by another population of greater adaptive value by whatever means. Or a population actually may become preadapted to an area other than its original one and may spread to it if available, partially or wholly removing from its original site. Lastly, although the ecologic complex of a refugium may change in certain critical respects, in many cases the population may be expected to be sufficiently plastic with regard to its tolerance to adjust to its environment and so continue to inhabit it. I feel that these opinions are in general harmony with those of Good,^{49, 50} the leading proponent of the theory of tolerance in plant geography, although certainly less so with those of such extreme adaptationists as Mason.⁵¹ The following examples will illustrate my position.

⁴⁷ Vaughan, T. W. A contribution to the geologic history of the Floridian plateau. Carnegie Inst. Wash. Publ. 133:99. 1910.

⁴⁸ Campbell, R. B. (quoted by R. E. Woodson, Jr.) Contr. Gray Herb. Harvard Univ. 165:12, 1947.

⁴⁹ Good, R. A theory of plant geography. New Phytologist 30:149. 1931.

⁵⁰ Good, R. The geography of flowering plants. Chap. 21. London & Colchester, 1947.

⁵¹ Mason, H. L. The edaphic factor in narrow endemism. I. The nature of environmental influences. Madroño 8:209. 1946.

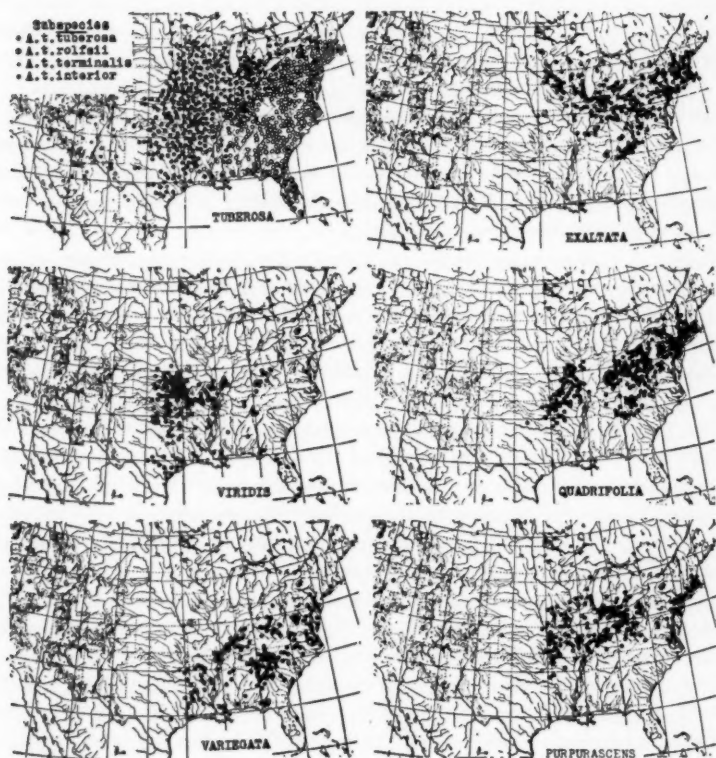


Fig. 5. Geographical distribution of six species of *Asclepias*. Explanation in the text.

The distribution of *Asclepias viridis* (fig. 5, middle left panel) is peculiar in its frequency on glades and prairies west of the Mississippi and south of the Missouri, and its relative rarity on the western slopes of the Appalachians and in Florida. Few known stations intervene. Plants of the three populations are indistinguishable to me. It seems to be that the range of *A. viridis*, as for *A. tuberosa*, is tricentric and probably of great age, but that subspeciation has not proceeded as in the latter. The Ozark representation appears obviously better adjusted to its environment than either the Appalachian or the Floridian which, in fact, appear poorly adjusted and in decline.⁵² It is remarkable that the species has but barely crossed into glaciated

⁵²Dr. E. Lucy Braun (to whom I had shown my manuscript) comments: "This species, in southern Ohio, occurs in habitats quite comparable to the glades of Missouri. It is sometimes very abundant and aggressive, spreading onto eroded slopes of poor pastures (from more natural prairie communities) where the plants are very large. The largest number are on slopes of Crab Orchard Shale, a sticky calcareous shale (Silurian). They are well adjusted to their environment, and I would not say that the species (in Adams County, at least) is on the decline, although its habitat is being lessened in extent because of closing-in of secondary woodlands, and cultivation."

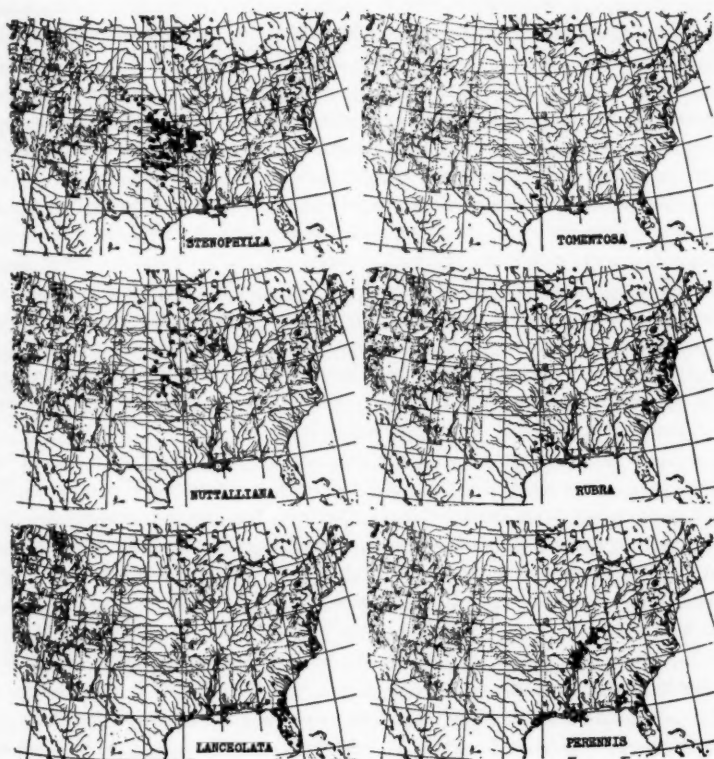


Fig. 6. Geographical distribution of six species of *Asclepias*. Explanation in the text.

areas, again unlike *A. tuberosa* with which it is characteristically associated ecologically in their common area. It has, however, populated such higher areas of the Mississippi embayment as Crowley's Ridge in Arkansas and southeastern Missouri and the Tupelo Hills in eastern Louisiana.

Asclepias variegata (fig. 5, lower left panel) is a species of thickets and open woods, usually in sandy or rocky soil. It obviously is an Appalachian species and monocentric. It is notable in its rather symmetrical adaptation to the varying ecological complexes of the high Appalachians of the Carolinas, Tennessee, and Georgia, the coastal lowlands from New Jersey to eastern Texas, and the southern Mississippi-Ohio lowlands. The emergence of ecotypes may be foreshadowed by local concentration of stations in various areas, particularly the southern Appalachian highlands and the Mississippi-Ohio lowlands.

The interesting distribution of *A. exaltata* (fig. 5) would be described as typically northeastern by some geographers since it lies predominantly within glaciated territory; they would interpret such a species as extending into the highlands of the southern Appalachians perhaps from nunataks in the north. I would interpret the data conversely: that being preadapted to the moist woods, meadows, and copses of the northeast, *A. exaltata* has proceeded to migrate into them from its ancient refugium in the southern Appalachians.

The bicentric distribution of *A. quadrifolia* (fig. 5) is exceptionally clear because of the disjunction of the Appalachian and Ozark populations. The species generally frequents rather dry and rocky woods and thickets, and the lower Mississippi lowlands and the prairies of Illinois and adjacent Indiana may be insuperable to the union of the eastern and western populations. Since the available habitats of the Ozarks are distinctly drier than those of the Appalachians, particularly to the north, an ecotypic response may have been evoked. Morphologically, however, I have found the two populations to be indistinguishable, contrary to expectation. The disjunction must be of very great antiquity.

Asclepias purpurascens (fig. 5), like *A. quadrifolia*, apparently consists of two disjunct populations which I would refer to Ozarkia and Appalachia as well. The species is unusually wide in its ecologic tolerance, frequenting thickets and open woods, prairies and fields, often escaping to roadsides and railway embankments. Unlike *A. quadrifolia*, however, here it is the Ozark population which is the larger, spreading from the Iowa prairies to the southern Great Lakes and to the western slopes of the Appalachians themselves. The Appalachian population proper, however, has withdrawn almost completely from its putative refugium to the middle and northern Atlantic coast.

The distribution of *A. stenophylla* (fig. 6) surely is Ozarkian; but from the western Ozarks, chiefly west of the Gasconade River, the species has fanned out into the plains of Kansas, Nebraska, Oklahoma, and adjoining margins of neighboring states. It would appear to have been preadapted to a plains environment because of an early occupancy upon the semi-xerophytic "bald-knobs" of the Ozarks; an environment, incidentally, which presently is being diminished by the encroaching forests. *Asclepias stenophylla* apparently is in the act of moving out from its ancestral home.

Asclepias nuttalliana (fig. 6) is the northernmost of the species of subgen. ACERATES, the remaining species of which (with the exception of the enigmatic Mexican *A. vinosa*) are clearly referable to the Ozarkian, the Appalachian, or the Floridian centers of concentration. The distribution of the species lies in a great arc from Lake Michigan to southern Kansas; from the northern prairies to the eastern Great Plains. The focus of the arc converges almost directly upon the Ozark plateau, the refuge from which I believe that it, or its immediate ancestors,

departed not long since, in terms of the history of the genus, *i.e.* subsequent to Pleistocene. I cannot suggest a simpler or more direct conclusion.

Distributions of the southeastern coastal plain involve inherent difficulties. Although stratigraphic geology, the impressive number of endemics, and such population dynamics as those of *Asclepias tuberosa rolfii* all lend support to the hypothesis of "Orange Island" as a refugium of great antiquity, it has been known for an even longer time that the southeastern coastal plain has received many Appalachian fugitives from the rigors of Pleistocene glaciation⁵³ and Late Tertiary uplift.⁵⁴ Just how to distinguish the old settlers from the new frequently is indecisive.

The distribution of *A. lanceolata* (fig. 6) is not greatly unlike that of *A. tuberosa rolfii* (fig. 5, upper left panel, which omits biometric evidence of *rolfii*-interior hybrids westward along the Gulf coast to eastern Texas and of *rolfii*-*tuberosa* hybrids up the Atlantic coast to Virginia⁵⁵), and for the purposes of this discussion it is classified as Floridian. The species frequents brackish to fresh marshes, wet pine barrens, and low glades.

Interesting variants of the same basic pattern are found in *A. tomentosa* and *A. rubra* (fig. 6). In the former, which prefers pine barrens and sandy soil, a once continuous distribution has been broken into three meagre, widely disjunct populations. In the latter, a species of bogs, marshes, wet meadows, and low pine barrens, the once continuous range appears to be breaking into two even more widely separated segments to northeast and southwest, and has withdrawn entirely from Florida (if, in fact, it ever occurred there, which seems reasonable to assume).

But the distribution of *A. perennis* (fig. 6) is most disconcerting, since it combines such a "Floridian" range as we have been discussing with scattering stations up the Mississippi embayment to the Mississippi-Ohio lowlands, where it is evidently most congenially located of all. The distribution of *A. perennis* appears to be an advancing (or retreating?) arc from the Appalachians much as we have seen in *A. nuttalliana* (fig. 6) with respect to the Ozarks, and I am classifying it as Appalachian in consequence. The species inhabits low swampy ground, alluvial woods, sloughs, and ditches and is characteristically in the company of *Taxodium*. Because it is an extremely primitive species morphologically, and because its present distribution so clearly outlines the Late Cretaceous coast, I feel that it may well have frequented these cypress swamps for a corresponding period (admittedly, of course, because the present environment parallels to such an extent that of the past). The Oligocene Bembridge beds⁵⁶ have yielded the unmistakable comose

⁵³Kearney, T. H. The Lower Austral elements in the flora of the southern Appalachian region. Science n. s. 12:830. 1900.

⁵⁴Braun, E. L. Some relationships of the flora of the Cumberland Plateau and Cumberland Mountains in Kentucky. Rhodora 39:193. 1937.

⁵⁵Woodson, R. E., Jr. Ann. Missouri Bot. Gard. 34:353. 1947.

⁵⁶Reid, E. M., and M. E. J. Chandler. The Bembridge Flora. London, 1926.

seeds of asclepiads, now far outside their native range, and I see no reason to accept that horizon as their first appearance.

Much less is known of the paleogeography of the western United States and Mexico than for the eastern United States, and analysis of plant distributions from that standpoint is scarcely justifiable in those areas. However, some possible information may be obtained by breaking down the data of Table I and interpreting them briefly in the light of comparative morphology and the broader details of historical geology.

Table II summarizes the incidence of the nine North American subgenera of *Asclepias* upon the six centers of concentration noted in fig. 4. From both tables it is strikingly apparent that the Mexican center includes more species than those of all the other five combined, and their diversification amongst the several subgenera is striking as well. Although no attempt has been made to generalize the maze of fig. 4 into sharply defined areas, it is obvious that in proportion to their relative sizes, the Mexican and the Floridian centers possess the most numerous and diversified species. The poorest in numbers and diversification is the Appalachian, if we exclude the Antillean from discussion at the moment.

Subgenus *ASCLEPIAS*, of course, is by far the richest of the genus, including over three-quarters of the total North American species. It is also diversified into eight indigenous series. Table III summarizes the distribution of species of the eight series amongst the six centers of concentration. Here, also, the Mexican and the Floridian centers are the richest in number and diversification of species, the Ozarkian mediocre, and the Appalachian and the Californian poorest, again excluding the Antillean.

TABLE II
NUMBERS OF SPECIES OF THE SUBGENERA OF *ASCLEPIAS* OCCURRING IN THE SIX
CENTERS OF CONCENTRATION IN NORTH AMERICA

Subgenera	Centers of concentration					
	Appalachian	Ozarkian	Floridian	Mexican	Californian	Antillean
<i>ASCLEPIAS</i>	11	12	9	41	6	1
<i>PODOSTEMMA</i>				5	1	
<i>ANANTHERIX</i>			1			
<i>ASCLEPIODELLA</i>			2	4	1	
<i>ACERATES</i>	1	3	1	1		
<i>SOLANOA</i>				1	2	
<i>POLYOTUS</i>		1		2		
<i>ASCLEPIODORA</i>	1	1	1	6		
<i>PODOSTIGMA</i>			1	2		

As I have emphasized in previous paragraphs, I am not convinced that my subgenera and series of *Asclepias* are wholly natural, particularly the series. Nevertheless, this system of a neglected genus certainly is the most complete and objective available at present. And since a collateral consideration of phylogeny should be helpful to an understanding of geographical distribution, Table IV has been compiled as a final summary of the data of Table I. In it the relative affinities of the six centers of concentration are correlated with respect to the subgenera and series held in common.

TABLE III

NUMBER OF SPECIES OF SUBGENUS *ASCLEPIAS* OCCURRING IN THE SIX CENTERS OF CONCENTRATION IN NORTH AMERICA

Series	Centers of concentration					
	Appalachian	Ozarkian	Floridian	Mexican	Californian	Antillean
INCARNATAE	3	3	1	9	1	1
TUBEROSAE	2	2	2			
EXALTATAE	2	1		7		
GRANDIFLORAE				3		
SYRIACAE	2	4	2	5		
PURPURASCENTES	2	2	1	4		
MACROTIDES			1	7		
ROSEAE			2	6	5	

TABLE IV

AFFINITIES OF THE SIX CENTERS OF CONCENTRATION OF *ASCLEPIAS* IN NORTH AMERICA CORRELATED WITH RESPECT TO THE SUBGENERA AND SERIES HELD IN COMMON

Represented in all six centers	INCARNATAE
Represented in four centers: Appalachian, Ozarkian, Floridian, Mexican	{ SYRIACAE PURPURASCENTES ACERATES ASCLEPIODORA
Represented in 3 centers	Appalachian, Ozarkian, Floridian TUBEROSAE Appalachian, Ozarkian, Mexican EXALTATAE Floridian, Mexican, Californian { ROSEAE ASCLEPIODELLA
Represented in 2 centers	Ozarkian, Mexican POLYOTUS Floridian, Mexican { MACROTIDES PODOSTIGMA Mexican, Californian { PODOSTEMMA SOLANOIA
Represented in only 1 center	Floridian ANANTHERIX Mexican GRANDIFLORAE

It might have been anticipated that the affinities of the Appalachian center would be chiefly with the Ozarkian and only secondarily with the Floridian and the Mexican; that those of the Ozarkian should be primarily and about equally with the Appalachian and the Mexican, and only secondarily with the Floridian; and that the primary affinity of the Californian should be unquestionably with the Mexican. But it comes as more of a surprise that the primary affinities of the Floridian center should be about equally with the Mexican and the Ozarkian and only secondarily with the Appalachian, and that those of the Mexican, the most strongly pronounced of all, should be with the Floridian. Eight bicentric species of the Appalachians and the Ozarkian emphasize the close affinity of those centers. The three tricentric species of the Appalachian, the Ozarkian, and the Floridian are evidence of the distinctive character of the Floridian. No species center both in Mexico or California and any center to the east.

It will also be noticed from Table IV that the one major taxonomic group represented in all six centers, including the single species of the Antillean, is the most primitive series *INCARNATAE*, of the typical subgenus, and furthermore that the Appalachian and the Ozarkian centers, as a rule, have more primitive subgenera and series as well as tending to less endemism. The greatest degree of endemism is shared by the Mexican and the Floridian, and perhaps the Californian which appears as scarcely more than an annex of the Mexican.

The historical reconstruction that I make of these data is that the ancestral home of *Asclepias* in North America is in the Appalachian and the Ozark highlands, paleozoic land masses upon which the genus may well have been represented in some form as early as Cretaceous. The strong similarity and slight degree of differentiation of the asclepiad populations in those areas may be a reflection of their great age as well as the relative geologic and ecologic stability of their habitats. The rather slight differences between them may be due in large part to the Pleistocene ice sheets to the north, and to the south the intervening Mississippi embayment and later its alluvium to which few asclepiads have proven themselves adaptable.

The great diversification of *Asclepias* in the Floridian center may be due in part to the fluctuating "Orange Island" archipelago in early Tertiary, and partly to the southward migration to the Coastal Plain (as it became available) of certain Appalachian elements in late Tertiary and Pleistocene; it is difficult to distinguish them except by special methods. Of one thing we can be fairly certain: that the Antilles contributed nothing.

With the draining of the Cretaceous seas from the Rocky Mountain geosyncline, the western United States and Mexico gradually received asclepiad immigrants from the east: from the Ozarks and from Florida. The crest of this westward migration may have been approached in Pliocene. It is obvious that migration from the Ozarks could have taken place far earlier than from Florida. Lastly, the great diversification of the rich asclepiad flora of Mexico may be ascribed to adaptive

radiation in response to the repeated Cenozoic orogenies culminating in Pleistocene. The Californian center, with its few species so slightly related to the Appalachian and the Ozarkian and so closely to the Mexican, may be considered the terminus of the westward migration.

A surprising thing about milkweeds is that they show so little of the ability to leap considerable distances, which one might expect to be the selective virtue of their comose seeds. An outstanding example of this anomaly is in the single species of the Greater Antilles, *A. nivea*, its failure to colonize the Bahamas or Florida, and conversely the absence of continental species on the islands. (The omnipresence of *A. curassavica* in the tropics of both hemispheres undoubtedly is due to escape from cultivation.) Such being the case, I would date the arrival of *Asclepias* in the Greater Antilles as Eocene, the time of their latest connection to the mainland of Central America. This would emphasize also the great speed with which the first asclepiads must have spread through Mexico and Central America as well as indicating their first source to have been the Ozarkian center, since Florida was archipelagic until Pliocene. It possibly is highly significant that the Antillean *A. nivea* is a species of the primitive series INCARNATAE and very closely related to the Mexican and Central American *A. angustifolia* and *A. woodsoniana*. That the speciation of *Asclepias* still continues in our time is emphasized dramatically by evidence of the recent birth of *A. tuberosa interior*.

Although the South American and the African centers of *Asclepias* are outside the scope of this study, I find it impossible to ignore them completely since, in some remote way, their history must be connected with that of the North American species. How does one account for the distantly trisected world distribution of the genus? To what extent may the phylogeny of the North American representation be tied up with that of the Southern Hemisphere?

There can be no shadow of doubt that the asclepiads of southeastern South America not only are congeneric with those of North America but are scarcely distinguishable from them. At one time I intended to include them within the present account but decided against doing so because the few species (and I cannot guess their number) show so little differentiation that the relatively few herbarium specimens available to me were insufficient for judging. All bear follicles on erect pedicels and the floral structure generally is similar to that of the North American INCARNATAE, but of size and coloration reminiscent of the TUBEROSAE. It would be most convenient, if a combined account were contemplated, to key them apart as a series solely on the basis of geography.

Probably none of the numerous African Asclepiadaceae would coincide wholly with my series of the typical subgenus ASCLEPIAS, and I anticipate that, if I were able to undertake a revision of the African species as a whole, an entirely different array of subgenera would emerge quite as diverse as those of North America, if not more so. In fact, I am fairly sure that I could not accommodate *Calotropis* within my system of *Asclepias*, extensible as it is, and the same would probably be true of *Schizoglossum* and others.

However, I am extremely suspicious of Bullock's⁵⁷ published intention of excluding *Asclepias* from Africa entirely, since I find it such a simple matter to include *A. fruticosa*, sporadically adventive in the New World, as representing merely a series of the typical subgenus *ASCLEPIAS*. The absence of attempts at generic keys in Bullock's preliminary notes also arouses misgivings which may be quieted by his final treatment for the 'Flora of East Africa.' Such keys, I anticipate, will bear a general resemblance to my keys to subgenera and series. Whatever our differences in matters of degree, I feel sure that Bullock and I would agree on the close alliance of the American and African Asclepiadeae.

Amongst the several possibilities of explaining the widely trisected distribution of *Asclepias* (in the broadest sense, to include those of Africa), only two commend themselves to me as worthy of serious consideration. One is trans-boreal migration, and the other is continental drift.

At the present day, no Asclepiadeae are indigenous to Eurasia save in the more xeric southeastern regions related to Africa. Nevertheless, comose seeds very suggestive of the tribe are figured by Reid and Chandler⁵⁸ in the Oligocene London clays, deposited under conditions probably more congenial to asclepiads than those now obtaining. Specifically, Pleistocene glaciation might be supposed capable of disrupting in most of Europe a primitive amphi-Atlantic distribution of ancestral *Asclepias*, which for our purpose must have extended at least intermittently from Patagonia northward to the Arctic in America and thence southward from boreal Europe to the Cape of Good Hope. The post-Pleistocene extreme xerism of northern Africa further might reduce the Eastern Hemisphere distribution of the genus essentially to what it is today.

It is in South America that this line of reasoning becomes excessively difficult, for here no indigenous Asclepiadeae are known, in fact from central Costa Rica to approximately the 16th parallel south, a distance of about 26 degrees of latitude. Admittedly, a vast majority of this area is tropical rain forest and not conducive to colonization by milkweeds of presently known preferences. On the other hand, I should imagine the savannas of the Roraima shield to be a likely habitat, as well certainly as extensive areas of the middle altitudes of the Andes. In fact, if the Cenozoic orogenies indeed were responsible for the rich diversification of *Asclepias* in Mexico, which seems an attractive hypothesis, it is difficult to see why the contemporary and closely related disturbances in the Andes could not have had a similar effect.

Finally, unless land connections in the Bering area could have been utilized for overland migration, which seems unlikely since we have seen reasons for assuming *Asclepias* to have reached the Pacific coast rather late in its development in North America, the obvious inability of modern species to cross even rather narrow straits in the Antilles would seem to militate against their chances of crossing the North

⁵⁷ Bullock, A. A. Notes on African Asclepiadaceae, I. Kew Bull. 1952:426. 1952.

⁵⁸ Reid, E. M., and M. E. J. Chandler. The Bembridge Flora, London, 1926.

Atlantic, even utilizing Greenland, Iceland, and other way stations. Of course infinitely less would seem their ability of crossing the South Atlantic directly from Brazil to Africa or *vice versa*.

Although Wegener's hypothesis of Continental Drift is by no means generally accepted by geologists, it would provide by far the easiest solution for the occurrence of *Asclepias* in South America and in Africa. Following this line of reasoning, one might advance the theory that the contemporary centers of the genus in North America and in South America never were directly connected except by means of a by-pass through Africa. According to such a view, the geologic and ecologic stability of the southeastern United States and southeastern Brazil might explain the relative conservatism and striking similarity of the asclepiad flora in those regions.⁵⁹

On the other hand, in Africa the drastic Cenozoic tectonic disturbances and vulcanism, particularly in East Africa, would introduce vast opportunities for adaptive radiation leading to the intricate biological diversification of today. Finally, the extreme xerism of North Africa might have obliterated representatives of the genus there in Post-Pleistocene. Of the two alternatives, I can see fewer biological objections to the Continental Drift.

ECONOMIC USES

Literature on the economic use of various species of *Asclepias* has become so voluminous since the outbreak of World War II that it is impossible to provide an adequate summary here. That function has been served very adequately by Miss Whiting⁶⁰ up to the year of publication. More recent literature may be sought amongst the entries in 'Biological Abstracts.'

Apparently utilization of *Asclepias* species was made by aborigines of both North America and Africa, chiefly with regard to the pericycle and phloem fibers of the stems and the seed coma (or "floss"). Pickering⁶¹ recounts that the seed floss of *A. syriaca* was used as a stuffing for pillows and cushions by the colonists of New England, and that seeds of the plant were sent to England by Governor John Winthrop in 1670. Transmitted thence to the European Continent, *A. syriaca* soon became naturalized in southern France, Corsica, and Dalmatia. By the middle of the 19th century not only *A. syriaca* but also *A. incarnata* were in cultivation and freely escaping almost throughout Europe. Various attempts have been made in England, France, Germany, and Russia to bring the plant into full commercial use.

⁵⁹ Without stronger evidence than comparative morphology (viz. polyploidy) it is quite impossible for me to conjecture whether *Asclepias* had its origin in the Northern Hemisphere or the Southern (cf. Camp, W. H. Distribution patterns in modern plants, etc. Ecol. Monogr. 17:159. 1947).

⁶⁰ Whiting, A. G. A summary of the literature on milkweeds (*Asclepias* spp.) and their utilization. U.S.D.A. Bibliogr. Bull. No. 2. 1943.

⁶¹ Pickering, C. Chronological history of plants. p. 945. Boston, 1879.

The stem fibers of *Asclepias*, particularly of *A. incarnata* and *A. syriaca*, have been proposed as a substitute for flax and hemp, although generally inferior to them.⁶² Milkweed latex has been mentioned repeatedly as a likely source of rubber in temperate latitudes. During World War II the seed floss proved to be the best substitute for kapok in the manufacture of life jackets for the U. S. Navy, and a harvest of 150,000 lbs. for that purpose was made during the year 1944.⁶³ Both the stem fiber and the floss have been advocated as stock for paper making. Secondary products of potential value include cellulose from the stems and a semi-drying oil from the seed. At the present time certain alkaloids of *Asclepias* are undergoing biochemical investigation, particularly with regard to the use of certain species as oral contraceptives.

During both World War I and World War II attention has turned to *Asclepias* as a widely diversified substitute for numerous strategically important plant products. Inevitably, after the close of hostilities and the resumption of normal commerce, the interest has died. The unfavorable showing of milkweed in peacetime is due essentially to the inability of a wild species to compete successfully with thoroughly domesticated and highly selected crop plants; what is truly surprising is that the comparison is not far more unfavorable. As a crop plant, a more serious handicap would be the more or less poisonous character of nearly all species, which makes *Asclepias* a dangerous pest in cattle and poultry areas.

⁶²Nelson, E. G., and S. T. Dexter. Fiber from the stems of common and swamp milkweed. Quart. Bull. Michigan Agr. Exp. Sta. 28:20. 1945.

⁶³Gunning, H. A. Milkweed floss for the Navy. U.S.D.A. Soil Conserv. 9:195. 1944.

EXPLANATION OF PLATE

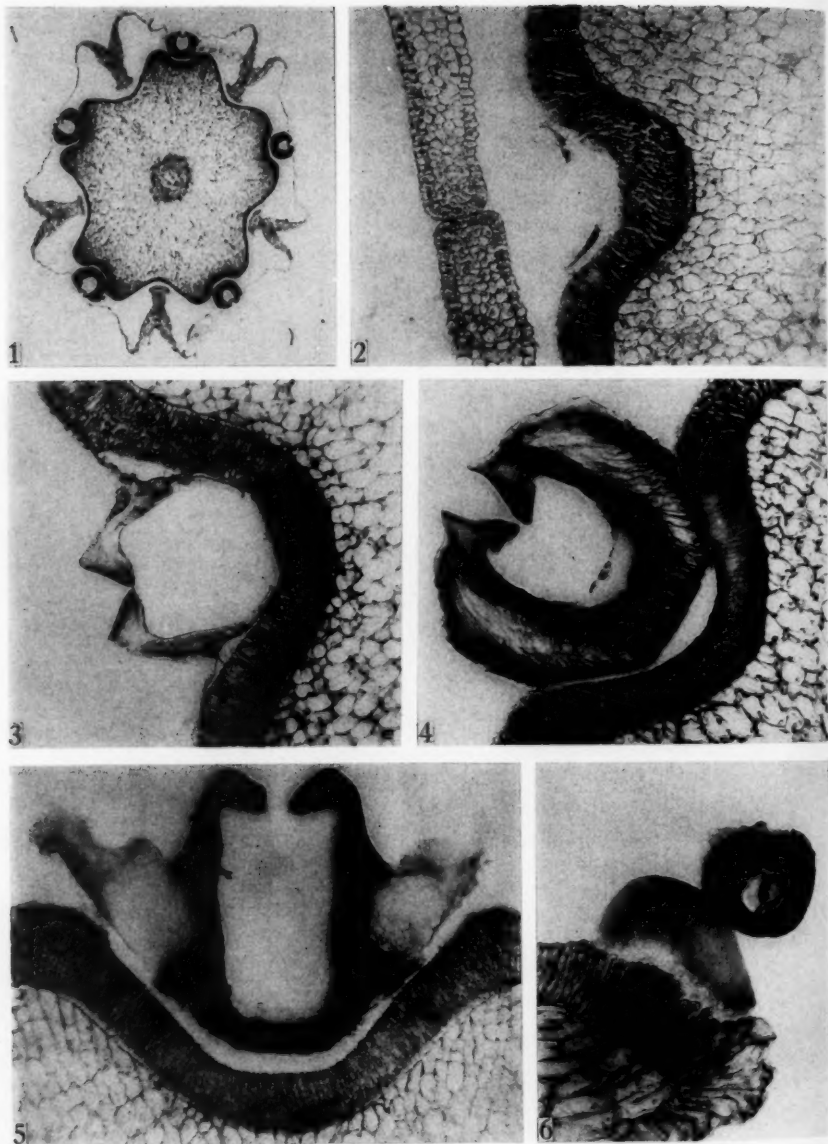
PLATE 1

Wasp visiting *Asclepias syriaca*. Inset: multiple pollinia on claw of bee (×7).

Portrait by Claude E. Johnston.



WOODSON — ASCLEPIAS



WOODSON — ASCLEPIAS

EXPLANATION OF PLATE

PLATE 2

Asclepias curassavica

Fig. 1. Transverse section of stigma head, showing furrows within which translator glands are secreted ($\times 19$).

Fig. 2. Stigma furrow, showing first secretions of translator gland ($\times 110$).

Fig. 3. Secretions of translator gland: later stage ($\times 110$).

Fig. 4. Translator gland fully formed: photographed with red filter to show striated structure ($\times 110$).

Fig. 5. Attachment of translator arms to gland: green filter ($\times 110$).

Fig. 6. Attachment of translator arm to pollinium sac: green filter ($\times 110$).

EXPLANATION OF PLATE

PLATE 3

Asclepias curassavica

Fig. 1. Transverse section of anther head, showing five concrescent anthers (with pollinium sacs) and intervening stigmatic chambers ($\times 19$).

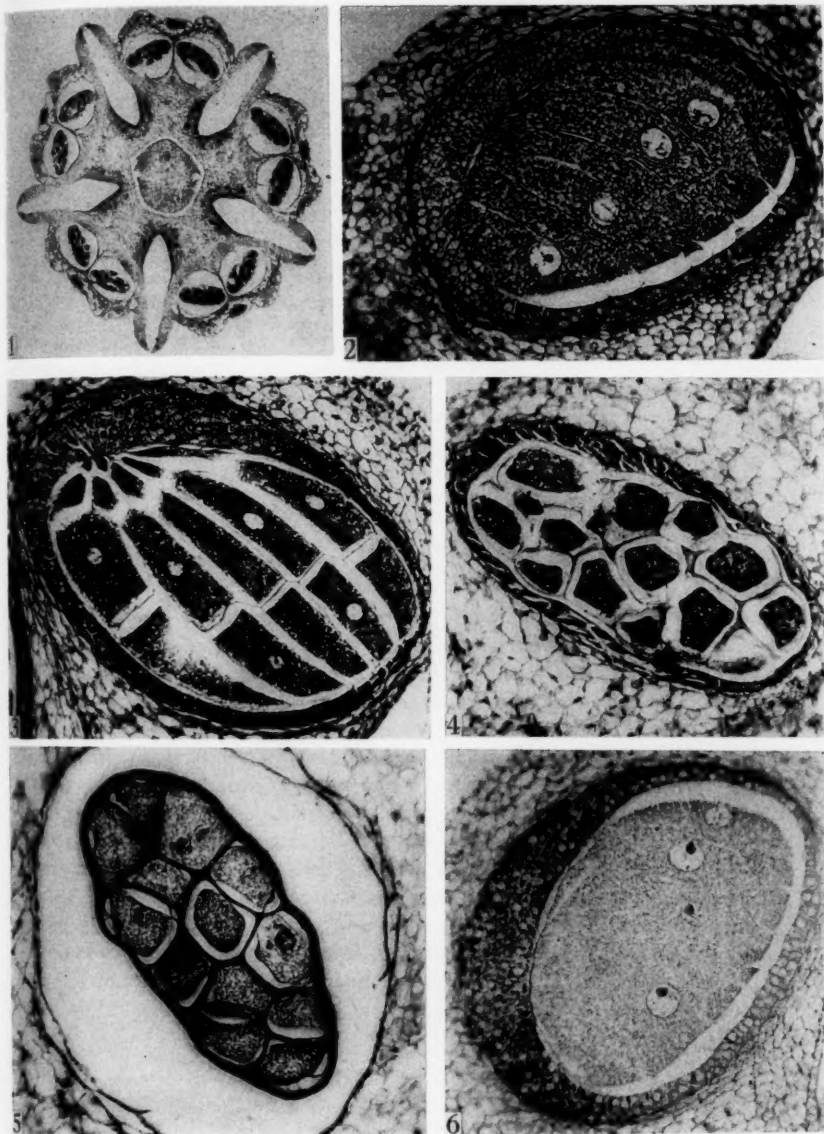
Fig. 2. Pollen mother cells surrounded by unequal tapetum: red filter ($\times 110$).

Fig. 3. Pollen diads: red filter ($\times 110$).

Fig. 4. Pollen tetrads, with suberization of intervening walls and disorganization of tapetum: red filter ($\times 110$).

Fig. 5. Mature pollinium sac: red filter ($\times 110$).

Fig. 6. Pollen mother cells surrounded by unequal tapetum: green filter to show lipoid bodies in outer tapetum ($\times 110$).



WOODSON — ASCLEPIAS

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TAXONOMY

ASCLEPIAS L. Sp. Pl. 214. 1753. [T.: *A. syriaca* L.]

Gomphocarpus R. Br. in Mem. Wern. Soc. 1:37. 1809. [T.: *G. arborescens* (L.) R. Br.,]

Acerates Ell. Sketch Bot. South Car. 1:316. 1817. [T.: *A. longifolia* (Michx.) Ell.]

Podostigma Ell. loc. cit. 326. 1817. [T.: *P. pubescens* Ell.]

Anthotis Raf. Fl. Ludov. 52, 149. 1817. [T.: *A. procumbens* Raf.]

Anantherix Nutt. Gen. North Am. Pl. 1:169. 1818; A. Gray, in Proc. Amer. Acad. 12:66.

1877. [T.: *A. connivens* (Baldw.) A. Gray]

Stylandra Nutt. loc. cit. 170. 1818. [T.: *S. pumila* Nutt.]

Otaria HBK. Nov. Gen. 3:192. 1819, nom. prov.; ex G. Don, Gen. Hist. 4:144. 1838.

[T.: *O. auriculata* (HBK.) G. Don]

Acerotis Raf. New Fl. North Amer. 1:49. 1836. [Based on *Acerates* Ell.]

Oligoron Raf. loc. cit. 60. 1836. [T.: *O. longifolium* (Michx.) Raf.]

Otanema Raf. loc. cit. 61. 1836. [T.: *O. latifolia* Raf.]

Polyotus Nutt. in Trans. Am. Phil. Soc. n. s. 5:199. 1837. [T.: *P. angustifolius* Nutt.,]

Asclepiodora A. Gray, in Proc. Amer. Acad. 12:66. 1877. [T.: *A. viridis* (Walt.) A. Gray]

Schizonotus A. Gray, loc. cit. 1877, non Lindl. (1840). [T.: *S. purpurascens* (A. Gray)

A. Gray]

Solanoa Greene, Pittonia 2:67. 1890. [Based on *Schizonotus* A. Gray]

Solanoana O. Ktze. Rev. Gen. 2:421. 1891. [Based on *Solanoa* Greene]

Oxypteryx Greene, Pittonia 3:234. 1897. [T.: *O. arenicola* (Nash) Greene]

Podostemma Greene, loc. cit. 235. 1897. [T.: *P. longicornu* (Benth.) Greene]

Biventaria Small, Man. Fl. Southeast. U. S. 1072. 1933. [T.: *B. variegata* (L.) Small]

Asclepiodella Small, loc. cit. 1073. 1933. [T.: *A. feayi* (Chapm.) Small]

Calyx lobes 5, equal, divided nearly to the receptacle, bearing few to many minute glandular squamellae within at the base. Corolla rotate, the lobes 5, valvate, equal, reflexed, spreading or rarely erect. Gynostegium definitely stipitate to subsessile; corona of 5 hoods attached to the column and subtending the connivent anthers, the hoods cucullate to clavate with various modifications, more or less stipitate to sessile and deeply saccate at the basal attachment to the column, usually bearing an internal horn or crest; anthers 2-locular, with more or less prominent corneous marginal wings enclosing the 5 stigmatic chambers and with membranaceous apical appendages, the pollinia paired and pendulous from the translator arms, flat and uniformly fertile, enclosing granular pollen with thin hyaline intine; stigma head peltate, more or less 5-gonal. Fruit follicular, containing many compressed comose or rarely naked seeds. Herbs, rarely fruticose or suffruticose, perennial or rarely annual, usually laticiferous. Leaves usually decussate, infrequently whorled or irregularly approximate. Inflorescence terminal or interpetiolar, umbelliformly cymose, very rarely (*A. sperryi*) reduced to a solitary flower.

KEY TO THE SUBGENERA

A. Hoods more or less stipitate or substipitate, the basal attachment not deeply saccate.

B. Hoods cucullate, the base involute or conduplicate but wholly laminate, the adnate horn (rarely absent) evident to the column or nearly so.....I. ASCLEPIAS

(p. 48)

BB. Hoods spatulate to clavate, with a conspicuous solid stipe and only the margins free to the base, the adnate horn merging with the basal stipe.

C. Hoods spatulate, broadly laminate above the middle; translator arms much shorter than the pollinium sacsII. PODOSTEMMA

(p. 152)

- CC. Hoods clavate, scarcely laminate; translator arms about three times as long as the pollinium sacsIII. ANANTHERIX (p. 160)
- AA. Hoods very sessile, the basal attachment deeply saccate, the adnate horn (frequently absent) typically reduced to an inconspicuous and isolated crest or terminal appendage.
- B. Hoods not deflexed from the anther head.
- C. Hoods without external basal appendages or merely somewhat keeled laterally.
- D. Hoods freely open above, the horn or crest present (except in *A. cordifolia*)IV. ASCLEPIODELLA (p. 161)
- DD. Hoods with the orifice appressed to the anthers, the horn absent.....V. ACERATES (p. 169)
- DDD. Hoods wholly or mostly closed by the closely involute margins, typically deeply bifid dorsally, the horn absent or reduced to an isolated incurved appendage.....VI. SOLANOA (p. 176)
- CC Hoods with 2 conspicuous external laminate basal appendages.....VII. POLYOTUS (p. 181)
- BB. Hoods sharply deflexed from the anther head (only slightly so in *A. elata*), thence typically with ascending involute, conduplicate, or clavate tips.
- C. Anther head sessile and immediately subtended by the hoods.....VIII. ASCLEPIODORA (p. 185)
- CC. Anther head borne on a stipe together with the alternating lobules high above the hoodsIX. PODOSTIGMA (p. 196)

SUBGENUS I. ASCLEPIAS

KEY TO THE SERIES

- a. Anther head about as long as broad, or slightly longer or slightly shorter; column cylindric or conic, rarely obconic; horns usually gradually tapered and arching over the anther head.
- b. Hoods broadly rounded or flattened dorsally.
- c. Hoods without sharply incised marginal auricles (except in *A. verticillata*); leaves opposite, verticillate, or spirally approximate; follicles erect on erect pedicels (pendulous or subpendulous in *A. perennis* and *A. leptopus*).....Series 1. INCARNATAE (p. 49)
- cc. Hoods with sharply incised marginal auricles; leaves opposite (except in *A. tuberosa*); follicles erect on deflexed pedicels.
- d. Hoods two to three times as long as the anther head, the marginal auricles basal and inflexedSeries 2. TUBEROSAE (p. 74)
- dd. Hoods slightly shorter than the anther head to about half longer, the marginal auricles incised toward the tip, usually spreading.....Series 3. EXALTATAE (p. 82)
- bb. Hoods strongly conduplicate, sharply keeled dorsally, with very broadly incised marginal auricles; follicles erect on deflexed pedicels.....Series 4. GRANDIFLORAE (p. 93)
- aa. Anther head about three-quarters as long as broad or somewhat shorter; column broadly obconic to essentially obsolete; horns usually abruptly beaked and sharply inflexed toward or over the anther head, occasionally absent.
- b. Hoods gradually rounded to acuminate; horns adnate to about midway of the hood or below when present.
- c. Hoods with sharply incised marginal auricles, usually broadly rounded dorsally; follicles erect on deflexed pedicels (erect on erect pedicels in *A. quadrifolia* and *A. viridula*; pendulous in *A. humilis* and *A. pellucida*).....Series 5. SYRIACAE (p. 99)
- cc. Hoods without sharply incised marginal auricles, but usually with broader lobing.
- d. Hoods usually broadly flattened dorsally, usually abruptly constricted to a short basal stipe; follicles erect on deflexed pedicels.....Series 6. PURPURASCENTES (p. 114)
- dd. Hoods narrowly keeled dorsally, sessile or subsessile; follicles erect on deflexed pedicels (erect on erect pedicels in *A. micbauxii*).....Series 7. MACROTIDES (p. 127)

- bb. Hoods truncate or very abruptly rounded at the tip, keeled dorsally; horns usually adnate the length of the hood or nearly so when present.
- c. Horns present; follicles erect on deflexed pedicels (pendulous or subpendulous in *A. labriiformis*) Series 8. ROSEAE (p. 135)
- cc. Horns absent or reduced to glandular crests; follicles erect on deflexed pedicels. African species sporadically introduced in the American tropics..... Series 9. FRUTICOSAE (p. 151)

Series 1. INCARNATAE

KEY TO THE SPECIES

- a. Hoods slightly shorter to about half longer than the anther head; translator arms ligular, narrower than the gland.
- b. Leaves opposite.
- c. Hoods slightly shorter to very slightly longer than the anther head.
- d. Inflorescences usually paired at the upper nodes, solitary below; flowers bright pink (rarely white); leaves broadly oblong-elliptic to narrowly oblong-lanceolate. Southern Nova Scotia, Quebec, Ontario, and Manitoba; Maine to Florida and westward to Utah and New Mexico 1. *A. incarnata*
- dd. Inflorescences solitary at the upper nodes; flowers white, the corolla occasionally tinged with purple without.
- e. Leaves oval to narrowly elliptic.
- f. Follicles erect on erect pedicels; seeds comose. Southwestern Texas; Coahuila and Nuevo León 2. *A. texana*
- ff. Follicles pendulous; seeds naked. South Carolina to Florida and westward to eastern Texas, lower Mississippi Valley to southern Indiana, Illinois and Missouri 3. *A. perennis*
- ee. Leaves narrowly lanceolate to linear-lanceolate, the base more or less hastate. Vera Cruz to Oaxaca and Chiapas; Guatemala; Honduras; El Salvador; Nicaragua; Costa Rica; Colombia (?) 4. *A. woodsoniana*
- eee. Leaves linear, attenuate at the base.
- f. Inflorescences lateral at several upper nodes, rather few-flowered and lax; flowers greenish white. South-central Texas 5. *A. linearis*
- ff. Inflorescences terminal or lateral at few upper nodes, many-flowered and dense; flowers strongly suffused with purple. Tamaulipas and San Luis Potosi 6. *A. pseudorubricaulis*
- cc. Hoods one-third to half longer than the anther head.
- d. Column somewhat longer than broad; flowers about 1.2–1.5 cm. long from hood to corolla lobe-tip, the corolla bright red (rarely white or yellow). Throughout tropical and subtropical America 7. *A. curassavica*
- dd. Column about as long as broad or somewhat shorter; flowers about 1 cm. long from hood to corolla lobe-tip or somewhat shorter, white or pink, sometimes slightly suffused with purple without.
- e. Leaves ovate to lanceolate-elliptic, conspicuously petiolate, more or less pubescent beneath. Antilles 8. *A. nivea*
- ee. Leaves linear to linear-lanceolate, inconspicuously petiolate, glabrous to inconspicuously pilosulose beneath. Southern Arizona; Tamaulipas to Sonora and southward to Chiapas 9. *A. angustifolia*
- bb. Leaves verticillate or spirally approximate.
- c. Leaves verticillate.
- d. Leaves more or less heterophyllous at the nodes, rather lax and spreading; stems usually with dwarf vegetative branches bearing reduced opposite leaves; hoods slightly shorter than the anther head.
- e. Inflorescences paired or clustered at the upper nodes; flowers grayish pink to white; leaves oblong- to linear-lanceolate. Idaho and Utah to Washington, Oregon, and California; Baja California 10. *A. fascicularis*
- ee. Inflorescences usually solitary at the upper nodes; flowers white; leaves linear. Colorado to Texas and westward to Idaho, Utah, and Arizona; San Luis Potosi to Sonora 11. *A. subverticillata*
- dd. Leaves isophyllous at the nodes, rather strictly ascending; stems usually without dwarf vegetative branches or those with verticillate leaves.

- e. Leaves elliptic to narrowly elliptic-lanceolate; inflorescences clustered or paired at the upper nodes; flowers greenish white and more or less suffused with purple; hoods slightly longer than the anther head, without incised marginal auricles. Nuevo Leon southward to Oaxaca12. *A. mexicana*
- ee. Leaves filiform; inflorescences solitary or paired at the upper nodes; flowers greenish white; hoods slightly shorter than the anther head and usually with incised marginal auricles. Southern Ontario and Manitoba; Massachusetts to Florida and westward to North Dakota and Texas.....13. *A. verticillata*
- cc. Leaves spirally approximate or the lowest occasionally verticillate, filiform; hoods slightly longer than the anther head and without incised marginal auricles. North Dakota to Texas and westward to Wyoming and New Mexico.....14. *A. pumila*
- aa. Hoods about two to three times as long as the anther head; translator arms broadly triangular, larger than the gland.
- b. Plants suffruticose; leaves caducous, filiform; flowers relatively small, greenish white; horns adnate to about midway of the hoods. Chihuahua, Sonora, and Sinaloa.....15. *A. leptopus*
- bb. Plants herbaceous; leaves persistent, linear to linear-lanceolate; flowers moderately large, the corolla bright red to pinkish, the hoods yellow; horns adnate to near the tip of the hoods. Chihuahua to Sinaloa and Nayarit16. *A. gentryi*

1. *ASCLEPIAS INCARNATA* L. Sp. Pl. 215. 1753. [T.: Linn. Herb. London, no. 310.25, photo!]

Herbaceous perennials from rather short and superficial root-stalks. Stems usually fairly stout, 4-15 dm. tall, simple to copiously branched. Leaves opposite



Fig. 7. *Asclepias incarnata* L.*

* In all figures: flowers $\times 2\frac{1}{2}$, pollinia $\times 10$.

or very rarely certain nodes condensed to form a false whorl, petiolate, ovate-elliptic to linear-lanceolate, the apex acute to acuminate, the base obtuse to somewhat cordate, 5–15 cm. long, 0.5–4.0 cm. broad, membranaceous; petioles 0.4–1.0 cm. long. Inflorescences usually paired at the upper nodes, solitary below, several to many-flowered; peduncles 1.5–7.0 cm. long; pedicels 1.0–1.5 cm. long. Flowers rather small; calyx lobes linear-oblong, 1.0–1.5 mm. long, pilosulose; corolla bright pink or rarely white, reflexed-rotate, the lobes 3–4 mm. long; gynostegium paler pink or rarely white, the column cylindric, 1.0–1.5 mm. long, about 1 mm. wide, the hoods cucullate, rounded at the tip, about 1.5 mm. long, the internal horn narrowly acicular, slightly incurved over the stigma head, somewhat longer than the hood; anther head about 1.5 mm. long. Follicles erect on erect pedicels, fusiform, long-attenuate, 7–9 cm. long, 0.8–1.2 cm. thick, smooth, glabrous to generally pilosulose; seeds broadly oval, 7–10 mm. long, the white coma about 2 cm. long.

KEY TO THE SUBSPECIES

Plants scatteringly and inconspicuously pubescent to essentially glabrous; stems usually repeatedly branching; leaves usually rather narrowly oblong- to linear-lanceolate, the apex gradually acuminate, the base obtuse to truncate, rather long-petiolate; Southern Quebec, Ontario, and Manitoba; Maine to Florida and westward to Utah and New Mexico.....

.....1a. *A. incarnata incarnata*

Plants generally and conspicuously pubescent; stems simple or branching infrequently; leaves ovate- to broadly oblong-elliptic, the apex acute to abruptly acuminate, the base rounded or somewhat cordate, infrequently broadly obtuse, rather short-petiolate. Nova Scotia; Maine to South Carolina, adventive in Ohio, Florida, and Texas.....

.....1b. *A. incarnata pulchra*

1a. *ASCLEPIAS INCARNATA* ssp. *INCARNATA*

Asclepias verecunda Salisb. Prodr. 150. 1796, nom. nud.

Asclepias amoena Brongn. in Ann. Sci. Nat. Ser. I, 24:275, t. 13. 1831, non L., ex ic.

Asclepias albiflora Raf. New Fl. N. Amer. 4:62. 1836, ex char.

Asclepias incarnata var. *longifolia* A. Gray, in Proc. Amer. Acad. 12:67. 1877, nom nud.

Asclepias incarnata f. *albiflora* Heller, in Bull. Torrey Bot. Club 21:24. 1894, ex char.

Watersides and moist soil. Southern Quebec, Ontario, and Manitoba; Maine to Florida and westward to Utah and New Mexico. Flowering from May to September.

CANADA: MANITOBA: St. Clement County. ONTARIO: Bruce, Carleton, Elgin, Essex, Hastings, Huron, Kenora, Lanark, Manitoulin Island, Middlesex, Nipissing, Northumberland, Parry Sound, Peel, Victoria, Welland, and Wellington counties. QUEBEC: Bellechasse, Brome, Chambly, Hochelaga, Hull, Labelle, Lotbiniere, Montmagny, Nicolet, and Pontiac counties.

UNITED STATES:

ARKANSAS: Benton and Washington counties.

COLORADO: Boulder, Denver, Fremont, Jefferson, Larimer, Logan, Weld, and Yuma counties.

CONNECTICUT: Litchfield and Middlesex counties.

FLORIDA: Collier, Dade, DeSoto, Duval, Flagler, Lake, Palm Beach, Polk, and Volusia counties.

ILLINOIS: Adams, Cass, Champaign, Clay, Clinton, Coles, Cook, Crawford, DeKalb, DuPage, Douglas, Effingham, Fayette, Iroquois, Jackson, Jefferson, Lake, LaSalle, Lee, Livingston, Logan, McHenry, McLean, Macon, Mason, Monroe, Ogle, Peoria, Piatt, Pike,

Richland, Rock Island, St. Clair, Saline, Stephenson, Stark, Tazewell, Vermilion, Wabash, Wayne, Whiteside, and Woodford counties.

INDIANA: Allen, Blackford, Boone, Carroll, Cass, Clay, Clinton, Dearborn, DeKalb, Dubois, Elkhart, Fayette, Franklin, Fulton, Gibson, Grant, Greene, Hancock, Harrison, Huntington, Jackson, Jay, Jefferson, Jennings, Knox, Kosciusko, LaGrange, Lake, LaPorte, Marshall, Miami, Montgomery, Newton, Noble, Orange, Owen, Parke, Pike, Porter, Posey, Randolph, St. Joseph, Scott, Shelby, Spencer, Starke, Steuben, Sullivan, Tippecanoe, Tipton, Vanderburgh, Wabash, Warren, Warrick, Wayne, Wells, White, and Whitley counties.

IOWA: Allamakee, Benton, Black Hawk, Boone, Calhoun, Cerro Gordo, Chickasaw, Clay, Clayton, Clinton, Dallas, Decatur, Dickinson, Emmet, Fayette, Floyd, Hamilton, Hancock, Humboldt, Jasper, Johnson, Kossuth, Lee, Linn, Lucas, Monona, Muscatine, O'Brien, Pocahontas, Palo Alto, Polk, Poweshiek, Ringgold, Sac, Sioux, Story, Tama, Union, Van Buren, Wright, Woodbury, Warren, Webster, Winnebago, and Winneshiek counties.

KANSAS: Bourbon, Brown, Cherokee, Cloud, Crawford, Decatur, Doniphan, Douglas, Ellsworth, Graham, Hamilton, Harper, Harvey, Hodgeman, Jackson, Johnson, Kingman, Kiowa, Labette, Leavenworth, Linn, Marshall, Miami, Neosho, Osage, Pottawatomie, Pratt, Reno, Republic, Rice, Riley, Rooks, Saline, Sedgwick, Sheridan, Shawnee, Stafford, Sumner, Washington, and Woodson counties.

KENTUCKY: Carroll, Fayette, Hart, Jessamine, Taylor, Union, Warren, Washington, and Wayne counties.

LOUISIANA: Terrebonne Parish.

MAINE: Androscoggin, Aroostook, Kennebec, Penobscot, Sagadahoc, and Somerset counties.

MASSACHUSETTS: Berkshire County.

MICHIGAN: Barry, Berrien, Calhoun, Cheboygan, Emmet, Gratiot, Ingham, Kalamazoo, Kent, Macomb, Newaygo, Oakland, Shiawassee, Van Buren, and Washtenaw counties.

MINNESOTA: Anoka, Becker, Brown, Carlton, Carver, Cass, Chisago, Clay, Clearwater, Cook, Douglas, Faribault, Goodhue, Hennepin, Houston, Hubbard, Itaska, Kandiyohi, Kanabec, Otter Tail, Polk, Pope, Ramsey, Red Wood, Roseau, St. Louis, Stearns, Wabasha, Waseca, Washington, Winona, and Wright counties.

MISSOURI: Barton, Bates, Boone, Butler, Clay, Dallas, DeKalb, Dent, Greene, Grundy, Henry, Howell, Jackson, Jasper, Jefferson, McDonald, Macon, Marion, Pettis, Phelps, Pike, Ralls, St. Louis, Scott, Stone, Texas, and Webster counties.

NEBRASKA: Brown, Cass, Chase, Cherry, Custer, Dawson, Dixon, Dodge, Douglas, Dundy, Franklin, Gage, Hooker, Kearney, Lincoln, Lancaster, Merrick, Otoe, Polk, Sarpy, Saunders, Sheridan, Thomas, and Webster counties.

NEW HAMPSHIRE: Cheshire, Coos, and Grafton counties.

NEW JERSEY: Middlesex, Somerset, and Warren counties.

NEW MEXICO: Chaves, Lincoln, and Otero counties.

NEW YORK: Cattaraugus, Cayuga, Chautauqua, Chenango, Clinton, Cortland, Delaware, Dutchess, Essex, Franklin, Greene, Herkimer, Jefferson, Lewis, Livingston, Madison, Niagara, Oneida, Onondaga, Orange, Oswego, Otsego, St. Lawrence, Saratoga, Seneca, Schenectady, Sullivan, Tompkins, Ulster, Washington, and Warren counties.

NORTH DAKOTA: Benson, Cass, and Richland counties.

OHIO: Ashtabula, Athens, Auglaize, Belmont, Brown, Butler, Carroll, Champaign, Clark, Clermont, Columbiana, Coshocton, Cuyahoga, Darke, Delaware, Erie, Fayette, Fairfield, Franklin, Gallia, Geauga, Guernsey, Hamilton, Harrison, Hardin, Highland, Hocking, Holmes, Huron, Jackson, Jefferson, Knox, Lake, Licking, Logan, Lorain, Madison, Mercer, Miami, Montgomery, Muskingum, Noble, Ottawa, Perry, Pike, Preble, Richland, Ross, Shelby, Scioto, Stark, Summit, Tuscarawas, Union, Warren, Washington, Wayne, Wood, and Wyandot counties.

OKLAHOMA: Cleveland, Craig, Delaware, Oklahoma, Osage, and Ottawa counties.

PENNSYLVANIA: Allegheny, Armstrong, Beaver, Bedford, Blair, Butler, Cambria, Chester, Clarion, Clearfield, Crawford, Erie, Fayette, Greene, Huntingdon, Indiana, Jefferson, Juniata, Lackawanna, Lancaster, Lawrence, Leigh, McKean, Mercer, Monroe, Montgomery, Montour, Northampton, Perry, Philadelphia, Somerset, Snyder, Venango, Warren, Washington, Wayne, and Westmoreland counties.

SOUTH DAKOTA: Bennett, Brookings, Clay, Custer, Deuel, Spink, Stanley, and Washington counties.

TENNESSEE: Blount, Cumberland, Grainger, Hawkins, Jefferson, Knox, Monroe, Rutherford, and Sullivan counties.

TEXAS: Dallas, Gonzales, Gillespie, Hood, and Kerr counties.

UTAH: Box Elder, Davis, and Utah counties.

VERMONT: Addison, Bennington, Caledonia, Chittenden, Essex, Franklin, Orleans, Rutland, and Windsor counties.

VIRGINIA: Arlington, Bath, Craig, Giles, Montgomery, Prince George, Rockingham, Shenandoah, Surry, and Warren counties.

WEST VIRGINIA: Barbour, Berkeley, Cabell, Grant, Hampshire, Hardy, Harrison, Jackson, Marion, Mason, Mercer, Mineral, Monongalia, Ohio, Preston, Putnam, Raleigh, Randolph, Ritchie, Summers, Upshur, Wetzel, and Wirt counties.

WISCONSIN: Ashland, Bayfield, Buffalo, Burnett, Columbia, Crawford, Dane, Grant, Iowa, Jefferson, Kenosha, Langlade, Lincoln, Marathon, Marinette, Marquette, Milwaukee, Ozaukee, Polk, Rock, St. Croix, Sauk, Walworth, Waukesha, Waushara, and Winnebago counties.

1b. *ASCLEPIAS INCARNATA* ssp. *pulchra* (Ehrh.) Woodson, stat. nov.

Asclepias pulchra Ehrh. ex Willd. Sp. Pl. 1:1267. 1797, ex char.

Asclepias incarnata β *pulchra* (Ehrh.) Pers. Syn. 1:276. 1805.

Asclepias lasiotis Raf. Aut. Bot. 178. 1840, ex char.

Asclepias maritima Raf. loc. cit. 1840, ex char.

Asclepias incarnata var. *neoscotica* Fern. in Rhodora 23:288. 1921. [T.: Fernald & Bissell 22318, GH!]

Asclepias pulchra f. *albiflora* House, in Bull. N. Y. State Mus. 243-244:61. 1921, ex char. [T.: Hollick s. n.]

Asclepias incarnata var. *pulchra* f. *candida* Fern. in Rhodora 41:446. 1939. [Based on *A. pulchra* f. *albiflora* House].

Watersides and moist soil, frequently in somewhat brackish tidal marshes. Nova Scotia; Maine to South Carolina, adventive in Ohio, Florida, and Texas. Flowering from June to August.

CANADA: NOVA SCOTIA: Digby, Halifax, Lunenburg, and Yarmouth counties.

UNITED STATES:

CONNECTICUT: Fairfield, Hartford, New Haven, New London, Middlesex, and Windham counties.

DELAWARE: Kent, New Castle, and Sussex counties.

FLORIDA: Volusia County.

GEORGIA: Macon County.

MAINE: Androscoggin, Cumberland, Franklin, Kennebec, Lincoln, Oxford, Penobscot, Sagadahoc, Somerset, Washington, and York counties.

MARYLAND: Anne Arundel, Baltimore, Cecil, Harford, Prince Georges, and Worcester counties.

DISTRICT OF COLUMBIA:

MASSACHUSETTS: Barnstable, Berkshire, Bristol, Dukes, Essex, Hampden, Hampshire, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester counties.

NEW HAMPSHIRE: Belknap, Carroll, Cheshire, Grafton, Hillsborough, Merrimack, Rockingham, and Strafford counties.

NEW JERSEY: Atlantic, Burlington, Camden, Cape May, Essex, Gloucester, Middlesex, Monmouth, Ocean, Salem, Somerset, and Union counties.

NEW YORK: Nassau, Richmond, Rockland, Suffolk, and Westchester counties.

NORTH CAROLINA: Alexander, Allegheny, Ashe, Beaufort, Burke, Caldwell, Caswell, Catawba, Cherokee, Currituck, Dare, Durham, Graham, Granville, Haywood, Henderson,

Hertford, Lincoln, Macon, Mecklenberg, Mitchell, Orange, Rowan, Stanley, Union, Wake, and Wilkes counties.

OHIO: Lake County.

PENNSYLVANIA: Bucks, Chester, Delaware, Franklin, Lancaster, Montgomery, and Philadelphia counties.

RHODE ISLAND: Bristol, Kent, Newport, Providence, and Washington counties.

SOUTH CAROLINA: Anderson and Greenville counties.

TENNESSEE: Blount and Knox counties.

VERMONT: Caledonia and Windham counties.

VIRGINIA: Bedford, Fairfax, Floyd, James City, Princess Anne, Surry, and Sussex counties.

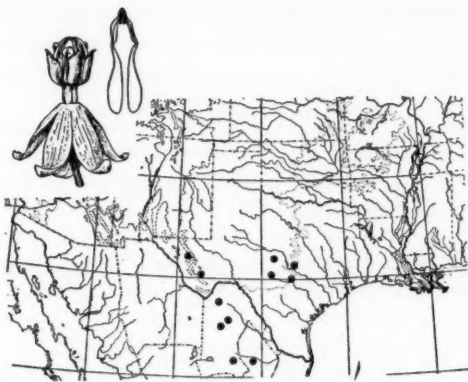
I interpret these two populations as allopatric subspecies because of the obvious genocline existing at the commissure of their natural distributions. This introgression lends itself to statistical analysis and was made a biometrical study by my friend and student, the late George K. Richardson, although still incomplete. From the unpublished data, it may be inferred that *A. i. incarnata* possibly spread northward and eastward from a refugium possibly in the Ozark upland at the retreat of glaciation, and that *A. i. pulchra* may have invaded the northeastern coastal plain from an ancestral home in the southern Appalachians subsequent to the last elevation of that upland and the retreat of the ice in the pattern made so familiar by Professor Fernald. At the present time, *A. i. pulchra* is frequent in more or less brackish lowlands roughly from the James estuary northeastward, and only occasional inland to elevations of approximately 2500 ft. in North and South Carolina.

2. *ASCLEPIAS TEXANA* Heller, Contr. Herb. Franklin & Marshall Coll., no. 1:77; pl. 4. 1895. [T.: Heller 1859, MO!]

Asclepias perennis var. *parvula* A. Gray, in Proc. Amer. Acad. 12:70. 1877. [T.: Bigelow s. n., GH!]

Asclepias parvula (A. Gray) Vail, in Bull. Torrey Bot. Club 26:423. 1899.

Herbaceous perennials, becoming somewhat shrubby at the base after several years. Stems slender, 2–4 dm. tall, usually branching only at the base, inconspicuously pilosulose in decurrent lines from the nodes. Leaves opposite, petiolate, broadly oval to narrowly oblong-elliptic, acuminate, obtuse or rarely attenuate at the base, 2–7 cm. long, 0.7–2.5 cm. broad, thinly membranaceous, finely puberulent upon the midrib and veins beneath; petioles 0.5–1.0 cm. long, minutely pilosulose. Inflorescences solitary at the uppermost nodes, several- to many-flowered; peduncles slender, 1–2 cm. long; pedicels 1.0–1.3 cm. long, finely puberulent. Flowers small; calyx lobes narrowly lanceolate, 1.5–2.0 mm. long, minutely puberulent; corolla reflexed-rotate, white, the lobes about 3 mm. long, widely spreading; gynostegium long-stipitate, white, the column cylindric, about 1.5 mm. long and 0.7 mm. wide at the base, the hoods cucullate, about 2 mm. long, rounded at the tip, the horn basal, narrowly acicular, nearly twice as long as the hood, slightly incurved over the anther head, the anther head about 2.5 mm. long. Follicles erect on erect pedicels, narrowly fusiform, 9–12 cm. long, smooth, glabrous; seeds broadly oval, about 8 mm. long, the white coma about 2 cm. long.

Fig. 8. *Asclepias texana* Heller

Canyons and arroyos. Southwestern Texas; Nuevo Leon and Coahuila. Flowering from June to August.

UNITED STATES:

TEXAS: Brewster, Comal, Jeff Davis, Kerr, Llano, and Travis counties.

MEXICO: COAHUILA: Saltillo, Villa Acuña, Monclova, Muzquiz, Cuatro Cienagas. NUEVO LEÓN: Monterrey.

I cannot distinguish *A. texana* from *A. perennis* except by means of the strikingly different fruit and seed, and the geographical distribution.

3. *ASCLEPIAS PERENNIS* Walt. Fl. Carol. 107. 1788, ex char.

Asclepias parviflora Ait. Hort. Kew. 1:307. 1789, ex char.

Asclepias pulchella Salisb. Prodr. 150. 1796, ex char.

Asclepias debilis Michx. Fl. Bor.-Amer. 1:116. 1803, ex char.

Asclepias parviflora Ait. var. *latifolia* Raf. Aut. Bot. 179. 1840, ex char.

Asclepias lancifolia Raf. loc. cit. 177. 1840, ex char

Herbaceous perennials from rather short and superficial root-stalks. Stems slender, 3–5 dm. tall, usually branching only from the base, very inconspicuously pilosulose in decurrent lines from the nodes, or essentially glabrous. Leaves opposite, narrowly oblong to broadly oval or ovate-elliptic, acuminate, attenuate at the base, 5–14 cm. long, 0.5–1.5 cm. broad, thinly membranaceous, glabrous; petioles 0.5–1.5 cm. long. Inflorescences solitary at the uppermost nodes, several- to many-flowered; peduncles slender, 1–4 cm. long; pedicels 1.0–1.3 cm. long, usually somewhat suffused with purple. Flowers small; calyx lobes oblong-elliptic, about 1 mm. long, sparsely and minutely pilosulose; corolla reflexed-rotate, white usually suffused with pale pink, the lobes 3–4 mm. long; gynostegium stipitate, white, the column cylindric, about 1 mm. long and wide, the hoods cucullate, rounded at the tip, about 2 mm. long, slightly longer than the anther head, the horn basal,

narrow-acicular, somewhat longer than the hoods, slightly arching over the anther head. Follicles pendulous on deflexed peduncles, rather broadly ovoid-fusiform with a rather long apical beak, 4-7 cm. long, 1.0-2.5 cm. broad, smooth, glabrous; seeds broadly oval, about 1.5 cm. long, without a coma.

Low swampy ground, frequently with bald cypress; alluvial woods, sloughs, and ditches. South Carolina to Florida and westward to eastern Texas, up the lower Mississippi Valley to southern Missouri, Illinois, and southwestern Indiana. Flowering from April to September.

ALABAMA: Tuscaloosa County.

ARKANSAS: Clay, Craighead, Crittenden, Desha, Drew, Jackson, Mississippi, Poinsett, Prairie, Pulaski, Randolph, and St. Francis counties.

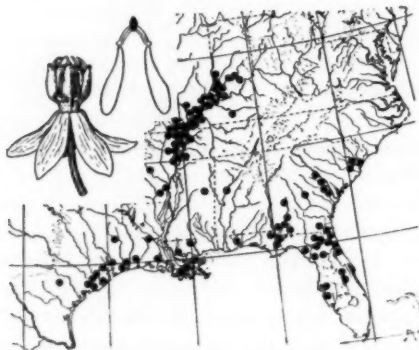


Fig. 9. *Asclepias perennis* Walt.

FLORIDA: Alachua, Columbia, Dixie, Duval, Escambia, Flagler, Gadsden, Hillsborough, Jackson, Levy, Liberty, Manatee, Marion, Nassau, Orange, Osceola, Putnam, St. Johns, and Union counties.

GEORGIA: Baker, Burke, Charlton, Dougherty, Jenkins, Laurens, Macon, Miller, Screven, and Thomas counties.

ILLINOIS: Alexander, Gallatin, Jackson, Johnson, Lawrence, Pope, Pulaski, Union, Wabash, Wayne, and White counties.

INDIANA: Dubois, Gibson, Jackson, Knox, Lawrence, Pike, Posey, Spencer, Sullivan, and Warrick counties.

KENTUCKY: Ballard, Carlisle, Henderson, Hickman, McCracken, Union, and Warren counties.

LOUISIANA: Calcasieu, Jefferson, Lafayette, Lafourche, Livingston, Orleans, Rapides, Terre Bonne, and Washington parishes.

MISSISSIPPI: Oktibbeha County.

MISSOURI: Butler, Dunklin, Ripley, and Wayne counties.

SOUTH CAROLINA: Berkeley, Georgetown, and Williamsburg counties.

TENNESSEE: Dyer and Shelby counties.

TEXAS: Angelina, Brazoria, Dallas, Fort Bend, Harns, Jackson, Jefferson, Liberty, Matagorda, Orange, and Wharton counties.

The peculiar pendulous follicles and large naked seeds would appear to be a striking adaptation to dissemination by water, but similar fruit and seed characters

of *Asclepias pellucida* and *A. humilis* are associated with very different habitats (highland pine, fir, and oak forests; rocky meadows).

4. *ASCLEPIAS WOODSONIANA* Standl. & Steyermark, in Field Mus. Publ. Bot. 23:224. 1947. [T.: Steyermark 31781, MO!]

Herbaceous perennials. Stems rather slender, 1–4 dm. tall, usually branching only from the base, very inconspicuously pilosulose in decurrent lines from the nodes or essentially glabrous. Leaves opposite, very shortly petiolate, narrowly lanceolate to linear-lanceolate, very gradually acuminate, the base typically more or less hastate-revolute, 5–17 cm. long, 3–12 mm. broad, membranaceous, glabrous or very inconspicuously pilosulose on the midrib beneath; petioles 1–3 mm. long. Inflorescences solitary at the uppermost nodes; peduncles 2–5 cm. long; pedicels 0.7–1.3 cm. long. Flowers small; calyx lobes lance-trigonal, about 2.5 mm. long; corolla reflexed-rotate, greenish white, the lobes about 5 mm. long; gynostegium white, stipitate, the column cylindric, about 1 mm. long and broad, the hoods cucullate, about 2 mm. long, the basal horns nearly twice as long as the hood, narrowly acicular and gradually incurved over the anther head, the anther head about 2 mm. long and broad. Follicles erect on erect pedicels, narrowly fusiform, 8–10 cm. long, about 5 mm. broad; seeds oval, about 7 mm. long, the coma about 2.5 cm. long.

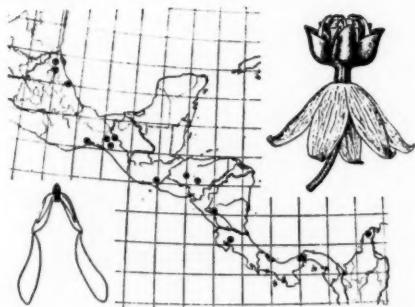


Fig. 10. *Asclepias woodsoniana* Standl. & Steyermark.

Meadows, occasionally pine-oak forest, thorn scrub, and salt flats, from near sea level to 1000 m. elevation. Southern Mexico to western Costa Rica. Flowering from March to August.

MEXICO: CHIAPAS: San Ricardo and Ocozucuantla. OAXACA: San Mateo del Mar. VERACRUZ: Guayabo, Rancho La Palmilla, Cuitlahuac, Santa María.

GUATEMALA: JUTIAPA: Trapiche Vargas and Asunción Mita.

HONDURAS: EL PARAÍSO: Galeras, Las Casitas. MORAZÁN: Río Yeguaré, Las Mesas, Maraita.

EL SALVADOR: AHUACHAPÁN: Ahuachapán. CHALATENAGO. LA UNION: Amatillo.

NICARAGUA: MANAGUA: Managua.

COSTA RICA: GUANACASTE: La Cruz.

This species, so well distinguished by the narrow, hastate-revolute leaves, also appears to have been collected near Puerto Colombia, Colombia, by Brother Elias (*Elias 1028* in Herb. Chicago Nat. Hist. Mus.).

5. *ASCLEPIAS LINEARIS* Scheele, in *Linnaea* 21:758. 1848. [T.: *Lindheimer 456*, MO!]

Asclepias verticillata var. *linearis* (Scheele) Pollard, in *Bull. Torrey Bot. Club* 24:156. 1897.

Herbaceous perennials from rather short and superficial rootstalks. Stems slender, 2–5 dm. tall, usually branching only at the base, inconspicuously pilosulose in decurrent lines from the nodes. Leaves opposite, sessile or subsessile, linear, 3–9 cm. long, 1–4 mm. broad, membranaceous, glabrous or minutely puberulent along the midrib beneath. Inflorescences solitary at several or many of the upper nodes, several-flowered; peduncles slender, 1.0–1.5 cm. long; pedicels 5–7 mm. long. Flowers small; calyx lobes lance-triangular, about 2 mm. long, minutely puberulent; corolla reflexed-rotate, greenish white, the lobes 3–4 mm. long; gynostegium long-stipitate, white, the column cylindric, about 1 mm. long and 0.5 mm. broad, the hoods cucullate, subquadrate, about 1.5 mm. long, the basal horn narrowly acicular, somewhat longer than the hood, gradually arching over the anther head; anther head about 1.5 mm. long and slightly narrower. Follicles erect on erect pedicels, narrowly fusiform, 5–10 cm. long, smooth, glabrous; seeds broadly oval, about 5 mm. long, the white coma about 2 cm. long.

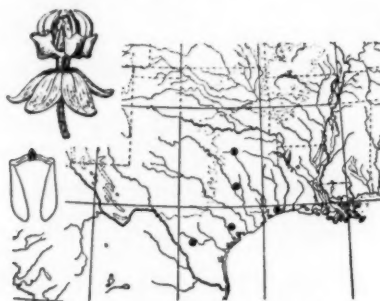


Fig. 11. *Asclepias linearis* Scheele

Dry prairies. South-central Texas. Flowering from May to September.

UNITED STATES:

TEXAS: Dallas, Jefferson, LaSalle, Milam, and Victoria counties.

This infrequently collected population is still something of an enigma to me, and I have been inclined at times to treat it as an opposite-leaved variety or subspecies of *A. verticillata*, as did Pollard. However, the species of Series INCARNATAE

as a whole show great floral uniformity and are distinguished habitually by vegetative characters which frequently are rather slight. Such being the case, and with its coherent distribution and apparent lack of intergradation, I am maintaining *A. linearis* as a species.

6. *ASCLEPIAS pseudorubricaulis* Woodson, spec. nov.

Herbae perennes ex caudice parvo radicibus numerosis fibrosis carnosiss. Caules graciles simplices vel subsimplices 1.5–7.0 dm. alti in lineas minute pubescentes e nodis decurrentes caeterumque glabri. Folia opposita linearia subsessilia 6–10 cm. longa 1–3 mm. lata revoluta glabra. Inflorescentiae ad nodos subterminales solitariae vel terminales multiflorae congestae; pedunculo 1.5–2.5 cm. longo sparse pilosulo; pedicellis ca. 1 cm. longis pilosulis. Flores inter species generis parvissimi; calycis laciniis anguste trigonalibus ca. 2 mm. longis inconspicue pilosulis; corolla reflexe rotata pallide purpurea lobis ca. 4 mm. longis; gynostegio anguste stipitato albedo, columna cylindrica ca. 1 mm. longo paullum minus lato, cucullis subquadratis minute sed distincte stipitatis ca. 1.25 mm. longis cornu basi adnato aciculari cucullo ca. bis longiore supra androecium leviter inflexo, androecio cylindrico ca. 1.5–1.75 longo et lato. Folliculi erecti pedunculo pedicello erectis anguste fusiformes ca. 6–9 cm. longi ca. 5 mm. lati laeves glabri; seminibus ovalibus ca. 5 mm. longis, coma alba ca. 2.5 cm. longa.

MEXICO: TAMAULIPAS: 25 mi. s. of Matamoras, *Wootton s. n.* (US). SAN LUIS POTOSÍ: between San Tiburcio and Angostura, *Purpus 5217* (F. GH. MO (HOLOTYPE), NY, UC, US); Minas de San Rafael, *Purpus 5569* (UC); Las Tablas, *Pennell 18054* (US).

Like nearly all other INCARNATAE except *A. curassavica* and *A. gentryi*, this species is distinguished by rather subtle differences of habit rather than the dramatic floral characters characteristic of the species of other series and subgenera.

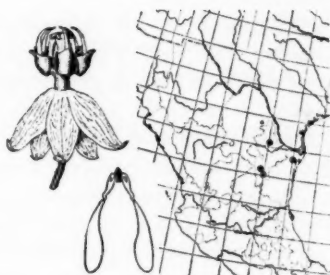


Fig. 12. *Asclepias pseudorubricaulis* Woods.

7. *ASCLEPIAS CURASSAVICA* L. Sp. Pl. 215. 1753. [T.: Linn. Herb. London, no. 310.19, photo!]

Asclepias bicolor Moench, Meth. 717. 1794, ex char.

Asclepias aurantiaca Salisb. Prodr. 150. 1796, nom nud.

Asclepias margaritacea Hoffmgg. ex Roem. & Schult. Syst. 6:86. 1820, ex char. [T.: Hoffmannsegg s. n.]

Asclepias cubensis Wender, in Bot. Zeit. 1:830. 1843, ex char.

Asclepias nivea var. *curassavica* (L.) O. Ktze. Rev. Gen. 1:418. 1891.

Asclepias curassavica var. *concolor* Kr. & Urb. in Urb. Symb. Ant. 1:389. 1899. [T.: *Sintennis 3949*, MO!]

Herbaceous annuals. Stems 3–12 dm. tall, frequently rather woody toward the base, simple or branched, minutely arachnoid-tomentulose when young, soon



Fig. 13.
Asclepias curassavica L.

glabrate. Leaves opposite, petiolate, elliptic-lanceolate, acute to acuminate, the base acute to obtuse, 5–12 cm. long, 1–3 cm. broad, minutely pilosulose when very young, soon glabrate, thinly membranaceous; petioles 0.5–1.0 cm. long. Inflorescences solitary at the upper nodes, several- to many-flowered; peduncles 3–6 cm. long; pedicels 1–2 cm. long. Flowers rather large and showy; calyx lobes narrowly lanceolate, 2–3 mm. long; corolla reflexed-rotate, bright crimson, rarely yellow or white, the lobes 5–10 mm. long; gynostegium long-stipitate, deep yellow, the column cylindric or conic, 2–3 mm. long and 1 mm. broad at the base, the hoods cucullate, distinctly stipitate, broadly oblong, rounded at the tip, 3–5 mm. long, the horn basal, narrowly acicular, 4–5 mm. long, slightly incurved over the anther head; anther head cylindrical, 2–3 mm. long, 1.5–2.5 mm. broad. Follicles erect on erect pedicels, narrowly fusiform, 6–10 cm. long, smooth, glabrous; seeds broadly oval, 5–7 mm. long, the white coma about 2–3 cm. long.

Almost ubiquitous waifs of the tropics and subtropics of the Americas, frequenting chiefly rather moist places at elevations from near sea-level to about 2000 m.; also widely introduced in the tropics of the Old World. Blooming sporadically throughout the year.

The native home of *A. curassavica* is quite conjectural. It is so named from Linnaeus' belief that its provenience is Curaçao; whether it is the Antilles, Mexico and Central America, or even southern South America appears quite impossible of solution. I am of the opinion that it is South American, although Sir Hans Sloane reported it widespread in Jamaica. In the southern United States the species has appeared as occasional ruderals in southern California, Florida, Louisiana, and Texas.

The species is so widespread and so familiar that it appears unnecessary to provide special data of its distribution.

Putative hybrids of *A. curassavica* \times *nivea* from Jamaica have been described by Urban (Symb. Ant. 1:388. 1899).

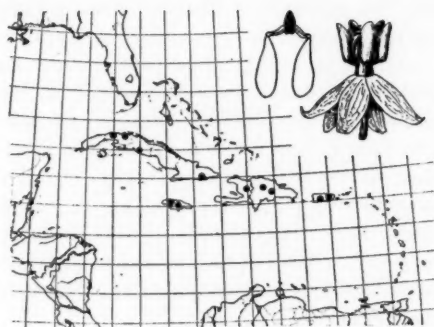
8. *ASCLEPIAS NIVEA* L. Sp. Pl. 215. 1753, ex ic. cit.

Asclepias nivea α *normalis* O. Ktze. Rev. Gen. 2:418. 1891, ex char.

Asclepias nivea β *flava* O. Ktze. loc. cit. 1891, ex char.

Asclepias nivea var. *intermedia* Schltr. in Urb. Symb. Ant. 1:244. 1899. [T.: Harris 5276, MO!]

Herbaceous annuals. Stems rather slender, 1–5 dm. tall, usually branching only from the base, generally puberulent when young, becoming glabrate. Leaves ovate to lanceolate-elliptic, apex acuminate, base acute to obtuse, 5–15 cm. long, 1–4 cm. broad, thinly membranaceous, rather inconspicuously puberulent on both surfaces, frequently glabrate above; petioles 0.5–1.5 cm. long. Inflorescences solitary at a few of the uppermost nodes, few- to several-flowered; peduncle 1.3–5.0

Fig. 14. *Asclepias nivea* L.

cm. long; pedicels slender, 1.0–1.8 cm. long. Flowers rather small; calyx lobes narrowly trigonal, about 2.5 mm. long, inconspicuously puberulent; corolla reflexed-rotate, pale green or greenish white, the lobes about 6 mm. long; gynostegium rather shortly stipitate, white, the column about 1 mm. long and broad, the hoods cucullate, rather narrowly oblong, shortly stipitate, about 3 mm. long, the horn slightly longer than the hood and arching over the anther head, the anther head cylindrical, about 2 mm. long and 1.4 mm. broad. Follicles erect on erect pedicels, narrowly fusiform, smooth, glabrous, 5–7 cm. long, about 6 mm. thick; seeds oval, about 5 mm. long, the white coma 1.5–2.0 cm. long.

Thickets and stream sides. Cuba, Jamaica, Hispaniola, and Puerto Rico. Flowering sporadically throughout the year.

CUBA: SANTA CLARA: Cienfuegos, Soledad. HABANA: Havana. MATANZAS: Matanzas.

JAMAICA: Farm Hill, Bog Walk, Moy Hall.

DOMINICAN REPUBLIC: San José de las Matas, Juan Santiago.

HAITI: St. Michel de l'Atalaye.

PUERTO RICO: Ciales, Ponce, Las Mesas.

Asclepias curassavica and *A. nivea* appear so distinct to me that I cannot understand the confusion and doubt which has surrounded them. The distinguishing characters as I view them are contained in the previous key to species. The species are so distinct, in fact, that I am rather skeptical of the reported hybrids.

In the Linnean Herbarium at London there are two specimens (nos. 310.21, and 310.22 labelled *Asclepias nivea*. Both are in fact specimens of *A. variegata* L., as shall be explained presently. There is no specimen of the population traditionally named *A. nivea* in the herbarium of Linnaeus.

In his description of *A. nivea* Linnaeus is quite enigmatic, but cites two unillustrated polynomials of Gronovius and Plumier and also an illustrated reference to Dillenius. The habit given is "*in Virginia & America calidiore*", suspicious at face value. The Gronovius reference may well apply to *A. variegata* and may explain the presence of the two sheets presently representing *A. nivea* in the

Linnaean Herbarium. The reference to Plumier, although rather sketchy, is sufficient to indicate the tropical American provenience of his plant. That to Dillenius (Dill. Hort. Elth. 1:33. *t.* 32. 1732) is virtually without doubt our *Asclepias nivea*: his extended description of *Apocynum persicariae mitis folio corniculis lacteis* is replete with detail obviously compiled from living plants, and the excellent full-page illustration of the plant in both flower and fruit quite closes the case.

Linnaeus, therefore, obviously included two quite separate elements under his *Asclepias nivea*: one coinciding with our present-day *A. variegata* and the other with *A. nivea* of present usage. Paradoxically, in the Linnaean Herbarium there is no specimen of *A. variegata* labelled as such by either Linnaeus or his son. Beside the two specimens of *A. variegata* labelled as *A. nivea* there is a third sheet of the species labelled *dilatata*, a manuscript name.

Were it not for the fact that Linnaeus' description of *A. variegata* is so explicit (*viz.* "*floribus albis intus purpureis*" which is incapable of confusion with any other species!), the matter might be more difficult of solution. As matters stand, I would suggest Linnaean Herb. no. 310.20 (*A. dilatata* ms.) as lectotype for *A. variegata*, and Dill. Hort. Elth. 1:33. *t.* 32. 1732) in lieu of type for *A. nivea*. This will leave the practical applications of the names precisely where they stand but upon a somewhat better understanding of sources.

9. *ASCLEPIAS ANGUSTIFOLIA* Schweig. Enum. Pl. Hort. Bot. Regiomont. 13. 1812, ex char.

Asclepias virgata Balb. Cat. Hort. Taur. 14. 1813, ex char.

Asclepias salicifolia Lodd. Bot. Cab. 3:*f.* 272. 1818, non Salisb., ex ic.

Asclepias rubricaulis HBK. Nov. Gen. 3:189. 1819, ex char. [T.: Bonpland 3919.]

Asclepias linifolia HBK. loc. cit. 190. 1819. [T.: Bonpland s. n., P photo!]

Asclepias linifolia Lag. ex Spreng. Syst. 1:847. 1825, ex char.

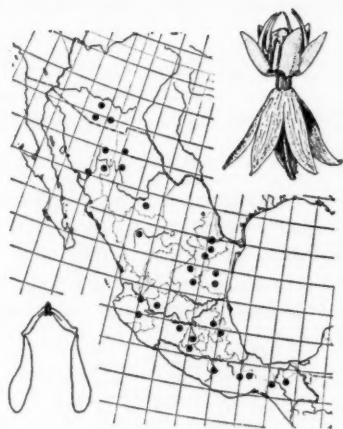
Asclepias longifolia Sessé & Moc. Fl. Mex. 2:72. 1894. [T.: Sessé & Mociño 1283, F!]

Asclepias angustifolia Sessé & Moc. loc. cit. 1894. [T.: Sessé & Mociño 1284, F!]

Asclepias jaliscana M. E. Jones, Contr. West. Bot. 12:49. 1908, non Robins. [T.: Jones s. n., MO!]

Asclepias tapalpana M. E. Jones, loc. cit. 14:35. 1912. [Based on *A. jaliscana* M. E. Jones.]

Herbaceous, usually somewhat suffrutescent annuals. Stems 1.5–8.0 dm. tall, slender, simple or repeatedly branching, minutely puberulent in decurrent lines from the nodes, eventually glabrate. Leaves opposite, shortly petiolate, linear to linear-lanceolate, acuminate, acute to attenuate at the base, 3–15 cm. long, 0.2–1.5 cm. broad, firmly membranaceous, frequently somewhat revolute, inconspicuously pilosulose beneath to wholly glabrous. Inflorescences solitary at rather few upper nodes, few- to several-flowered; peduncle 1–2 cm. long; pedicels 1.0–1.5 cm. long. Flowers small; corolla reflexed-rotate, white, rarely pink, the lobes 4–5 mm. long; gynostegium white, stipitate, the column cylindrical, about 1 mm. long and broad, the hoods cucullate, oblong, distinctly stipitate, 3–4 mm. long, the horn basal, narrowly acicular, slightly longer than the hood, gradually arching over the anther head, the anther head cylindric, about 2 mm. long and broad. Follicles erect on

Fig. 15. *Asclepias angustifolia* Schweig.

erect pedicels, narrowly fusiform, about 6–10 cm. long and 5–8 mm. thick, smooth, essentially glabrous; seeds oval, 5–6 mm. long, the white coma 1.5–3.0 cm. long.

Creek bottoms, canyons, and arroyos. Southern Arizona; Tamaulipas to Sonora and southward to Chiapas. Flowering sporadically throughout the year.

UNITED STATES:

ARIZONA: Cochise, Pima, and Santa Cruz counties.

MEXICO: CHIAPAS: San Ricardo, Ocozucuantla. CHIHUAHUA: Galleana, Sierra Charuco, Tosanachic, Colonia Díaz. DURANGO: Tobar. GUERRERO: Taxco. HIDALGO: Huejutla. JALISCO: Chiquilistlán, Sierra de Nayarit, Sierra de la Campaña, Guadalajara. MEXICO: Temascaltepec. MICHOACAN: Morelia. NUEVO LEON: Monterrey, Villa de Santiago, Dulces Nombres. OAXACA: Tlaxiaco, Yavezia, Misteca Alta, Chicahuastla. PUEBLA: Puebla. SAN LUIS POTOSÍ: San Luis Potosí, Las Canoas. SONORA: Bavispe, Alamos, Cañon de El Tremblor. TAMAULIPAS: San José, Victoria, Jaumave.

This is a very frequent species in the Mexican uplands. Interpretation of Schweigger's and Balbis' names is based not so much on the brief original diagnoses as on specimens bearing the names which are deposited in the Bernhardt Herbarium of the Missouri Botanical Garden. These plants probably were grown in Bernhardt's garden at Erfurt at about the time of publication of their names, and quite possibly came from seed from the original plants. The type specimen of *A. rubricaulis*, although cited by Fournier (Ann. Sci. Nat. Ser. VI, 14:376. 1882), cannot now be found at the Paris herbarium. *Galeotti 1617*, also cited for *A. rubricaulis* by Fournier, is rather widely represented in European and American herbaria, however, and is the basis for my association of the name with *A. angustifolia* Schweig.

10. *ASCLEPIAS FASCICULARIS* Dcne. in DC. Prodr. 8:569. 1844. [T.: Douglas s.n., K photo!]

Asclepias macrophylla Nutt. in Jour. Acad. Phila. Ser. II, 1:180. 1847. [T.: Nuttall s.n., BM photo!]

Asclepias macrophylla var. *comosa* Dur. & Hilg. in Rept. Expl. Pacific R. R. Surv. 5:370. t. 8. 1856, ex ic.

Asclepias fasciculata Hemsl. Biol. Centr.-Am. Bot. 2:324. 1882, sphalm.

Herbaceous perennials from rather stout woody rootstalks. Stems 4–10 dm. tall, almost invariably with numerous microphyllous axillary branches, rarely simple, usually more or less puberulent in decurrent lines from the nodes, frequently glabrate. Leaves predominantly 3-nate or 4-nate upon the flowering stems, shortly petiolate, oblong- to linear-lanceolate, acuminate to obtuse at the tip, acute to



Fig. 16. *Asclepias fascicularis* Dcne.

obtuse at the base, 3–12 cm. long, 0.1–2.5 cm. broad, membranaceous, glabrous to inconspicuously pilosulose beneath, those of the sterile dwarf branches opposite and much reduced, giving the plants a heterophyllous appearance; petioles 1–3 mm. long. Inflorescences paired or clustered at the uppermost nodes, several- to many-flowered; peduncle rather slender, 2–4 cm. long; pedicels slender, 0.7–1.5 cm. long. Flowers rather small; calyx lobes narrowly trigonal, 1.0–1.5 mm. long, pilosulose to glabrate; corolla reflexed-rotate, usually grayish pink, infrequently white, the lobes 3–4 mm. long; gynostegium narrowly stipitate, grayish pink or white, the column cylindric, about 1 mm. long and broad, the hoods cucullate, oval, about 1.0–1.5 mm. long, the horn basal, narrowly acicular, about half longer than the hood, gradually arching over the anther head, the anther head cylindric, about 1.5 mm. long and broad. Follicles erect on erect pedicels, narrowly fusiform, about

5–12 cm. long and 0.7–1.0 cm. thick, smooth, glabrous; seeds oval, 6–7 mm. long, the white coma about 2 cm. long.

Plains, hills, and valleys, in moist or dry soil; spreading to roadsides and waste places; regarded as poisonous to stock. Idaho, Utah, and Nevada westward to the Pacific Coast; northern Baja California. Flowering from May to October.

UNITED STATES:

CALIFORNIA: Alameda, Alpine, Amador, Butte, Calaveras, Contra Costa, Eldorado, Fresno, Glen, Inyo, Kern, Lake, Los Angeles, Mariposa, Mendocino, Merced, Mono, Monterey, Napa, Orange, Placer, Plumas, San Bernardino, San Diego, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Shasta, Siskiyou, Solano, Sonoma, Sutter, Tehama, Trinity, Tulare, Tuolumne, and Yuba counties.

IDAHO: Adams, Blaine, Boise, Idaho, Owyhee, and Washington counties.

NEVADA: Churchill, Elko, Lyon, Mineral, Storey, and Washoe counties.

OREGON: Benton, Curry, Hood River, Jackson, Josephine, Klamath, Marion, Wasco, Union, and Umatilla counties.

UTAH: Davis and Utah counties.

WASHINGTON: Klickitat, Spokane, and Yakima counties.

MEXICO: BAJA CALIFORNIA: Vallecitos, Monument No. 245, San Ysidro.

This is the "*Asclepias mexicana*" of most American authors. Durand & Hilgard's plate (*vide ante*) is an excellent one, and illustrates the dwarf sterile branches with their reduced opposite leaves in fine detail. Similarly, Cavanilles' plate of his *A. mexicana* (lc. 1:t. 58. 1791) is quite as good for the latter species. I suppose that the confusion has been due in part to our failure to appreciate the systematic importance of the presence or absence of the microphyllous branches, and in part to the scarcity of herbarium specimens of the true *A. mexicana*.

The verticillate-leaved species of INCARNATAE form a most interesting *artenkreiss* which I assume to have originated from *A. incarnata*. Certainly it would be very difficult to distinguish *A. fascicularis* from *A. incarnata* except for the phyllotaxy if the two species possessed a common distribution. *A. fascicularis* is essentially a western *A. incarnata*. As it extends to the southeast, however, it gradually merges into *A. subverticillata* throughout the southern Great Basin area. In turn, as *A. subverticillata* reaches the Great Plains, it is replaced by *A. verticillata*, which extends on to the Atlantic coast. *Asclepias mexicana* might be visualized as a vicariad extending southward in the Mexican upland, and *A. pumila* as an offshoot northward in the western Great Plains.

The most closely related units of this *artenkreiss*, say *A. fascicularis* and *A. subverticillata*, might be interpreted as subspecies of a single species if viewed separately. Yet any adjacent members of the series are similarly related, and it would be unthinkable to associate the end members within a single species, as *A. incarnata* or *A. verticillata*, for example.

11. ASCLEPIAS SUBVERTICILLATA (A. Gray) Vail, in Bull. Torrey Bot. Club 25:178. 1898.

Asclepias verticillata var. *subverticillata* A. Gray, in Proc. Am. Acad. 12:71. 1877. [T.: Wright 1685, MO!]

Herbaceous perennials from rather stout, woody rootstalks. Stems 1.5–12 dm. tall, almost invariably with sterile, dwarf, microphyllous branches, occasionally simple, more or less puberulent in decurrent lines from the nodes, occasionally quite glabrous. Leaves predominantly 3-nate to 5-nate but occasionally opposite above on the flowering stems, shortly petiolate, linear, 2–13 cm. long, 1–4 mm. broad, membranaceous, glabrous to inconspicuously pilosulose, those of the sterile dwarf branches opposite and much reduced and giving the plant a heterophyllous aspect; petioles 1–2 mm. long. Inflorescences usually solitary at the upper nodes, rarely paired, several- to many-flowered; peduncle slender, 1.5–3.0 cm. long; pedicels slender, 5–8 mm. long. Flowers relatively small; calyx lobes narrowly trigonal, 1.5–2.0 mm. long, inconspicuously pilosulose to glabrate; corolla reflexed-rotate, white, rarely slightly suffused with greenish purple, the lobes 3–5 mm. long; gynostegium narrowly stipitate, white, the column cylindrical, about 1 mm. long and slightly narrower, the hoods cucullate, oval, about 1.5 mm. long, the horn basal, narrowly acicular, somewhat longer than the hoods, gradually arching over the anther head; anther head cylindric, about 1.5 mm. long and broad. Follicles erect on erect pedicels, narrowly fusiform, about 5–9 cm. long and 6–8 mm. thick, smooth, glabrous or inconspicuously pilosulose; seeds broadly oval, 7–8 mm. long, the white coma about 2 cm. long.

Sandy and rocky plains and flats; very poisonous to stock. Arizona, New Mexico, southern Utah and Colorado, western Texas; northern Mexico from Nuevo León to Sonora. Flowering from June to August.

UNITED STATES:

ARIZONA: Apache, Cochise, Coconino, Gila, Navajo, Pima, Pinal, and Yavapai counties.

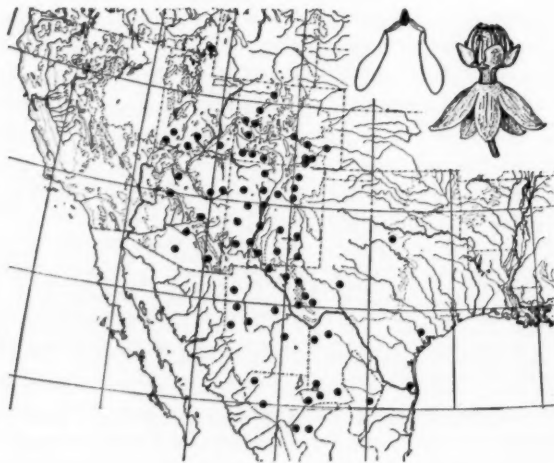


Fig. 17. *Asclepias subverticillata* (Gray) Vail

COLORADO: Archuleta, Bent, Crowley, Delta, Fremont, Garfield, La Plata, Larimer, Las Animas, Mesa, Montezuma, Otero, Pueblo, and Routt counties.

IDAHO: Bear Lake County.

NEW MEXICO: Bernalillo, Catron, Chaves, Colfax, Dona Ana, Eddy, Grant, Lincoln, McKinley, Otero, Rio Arriba, Sandoval, San Miguel, Santa Fe, Sierra, Socorro, and Valencia counties.

TEXAS: Archer, Brewster, Cameron, Culberson, El Paso, Hudspeth, Jeff Davis, Presidio, Upton, and Victoria counties.

UTAH: Garfield, Iron, Kane, San Juan, and Washington counties.

MEXICO: CHIHUAHUA: Chihuahua, Villa Ahumada, Carretas, Cd. Camargo, Colonia Díaz. COAHUILA: Saltillo, Parras, Castillon, San Lorenzo de Laguna, Puertecito, La Ventana, Avalos, Torreón, Americanos. DURANGO: Tepehuanes, Durango, Nombre de Dios, Bermejillo, Villa Juárez. NUEVO LEÓN: Galeana. SONORA: San Pedro, El Potrero.

This is the "*Asclepias galioides*" of most American authors. Gray's var. *subverticillata* was based upon Torrey's *A. verticillata* var. *galioides* as to specimens cited, amongst which I am choosing Wright 1685 as the lectotype, since it exemplifies the species well and is represented in numerous herbaria. *A. subverticillata* is further discussed under *A. fascicularis*. True *A. galioides* HBK. is merely a narrow-leaved variant of *A. mexicana* Cav.

12. *ASCLEPIAS MEXICANA* Cav. Ic. 1:42. f. 58. 1791. [T.: Herb. Cav., MA!]

Asclepias galioides HBK. Nov. Gen. 3:188. 1819. [T.: Bonpland 4304, P photo!]

Asclepias verticillata var. *a galioides* (HBK.) Fourn. Ann. Sci. Nat. Ser. VI, 14:375. 1882 (ascribed to Kunth).

Asclepias verticillata var. *β mexicana* (Cav.) Fourn. loc. cit. 1882.

Herbaceous perennials. Stems rather slender, 2–7 dm. tall, simple and homophyllous, very rarely with sterile, dwarf, microphyllous branches toward the base, inconspicuously puberulent in thin decurrent lines from the nodes, or essentially glabrous. Leaves chiefly 4-nate to 6-nate, shortly petiolate, elliptic to narrowly elliptic-lanceolate, apex acute to acuminate, base acute to obtuse, 2–13 cm. long, 1.5–15 mm. broad, firmly membranaceous, scatteringly pilosulose beneath to essentially glabrous, frequently somewhat revolute; petioles 1–8 mm. long. Inflorescences paired or clustered at the uppermost nodes, rather many-flowered; peduncle 1–5 cm. long; pedicels slender, 0.8–1.2 cm. long. Flowers rather small; calyx lobes narrowly elliptic, rather inconspicuously pilosulose, 2.5–3.0 mm. long; corolla reflexed-rotate, white but usually more or less suffused with purple, the lobes about 5 mm. long; gynostegium narrowly stipitate, white, the column cylindric, 1 mm. long and broad, the hoods cucullate, oval, 2.0–2.5 mm. long, the basal horn narrowly acicular, somewhat longer than the hood and gradually arching over the

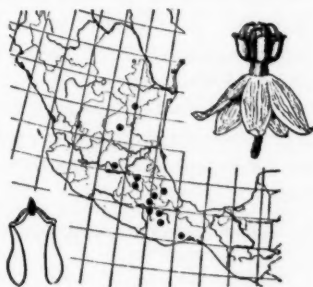


Fig. 18. *Asclepias mexicana* Cav.

anther head, the anther head cylindric, about 1.5–2.0 mm. long and broad. Follicles erect on erect pedicels, narrowly fusiform, about 7–10 cm. long and 5–8 mm. thick, smooth, essentially glabrous; seeds broadly oval, 4–5 mm. long, the white coma 2.0–3.5 cm. long.

Wet meadows and marshes, spreading to scrub and waste places; central Mexico. Flowering from May to November.

MEXICO: DISTRITO FEDERAL: Valley of Mexico. GUANAJUATO: León. MEXICO: Tlalnepantla. NUEVO LEÓN: Galeana. OAXACA: Cerro Verde, Etla, San Miguel Quilitongo, Chicahuastla. PUEBLO: Rancho Posadas, Guadalupe. SAN LUIS POTOSÍ: San Luis Potosí. VERACRUZ: Acultzingo.

Extremely variable in the size and width of the leaves, *A. mexicana* appears to be a vicariad of *A. incarnata* of the eastern United States, not only in natural relationship but in habitat preference.

13. *ASCLEPIAS VERTICILLATA* L. Sp. Pl. 217. 1753. [T.: Linn. Herb. London, no. 310.38, photo!]

Asclepias parviflora Leconte, ex Dcne. in DC. Prodr. 8:570. 1844, nom. nud. in synon.

Herbaceous perennials from rather short, superficial rootstalks. Stems slender, 1.5–9.0 dm. tall, simple, or rarely with short sterile branches, more or less puberulent in decurrent lines from the nodes, rarely glabrate. Leaves chiefly 3-nate or 4-nate, rarely opposite in part, sessile or subsessile, linear, 1.5–7.0 cm. long, about 1.5 mm. broad, membranaceous, glabrous or essentially so, usually somewhat revolute. Inflorescences solitary or paired at the upper nodes, few- to many-flowered; peduncles slender, 1.5–3.0 cm. long; pedicels slender, 6–8 mm. long. Flowers small; calyx lobes narrowly trigonal, 1.5–2.5 mm. long, sparsely pilosulose to glabrous; corolla reflexed-rotate, greenish white occasionally somewhat flushed with purple without, the lobes about 3.5 mm. long; gynostegium narrowly stipitate, greenish white, the column narrowly cylindrical, about 1 mm. long and somewhat narrower, the hoods cucullate, subquadrate, about 1.5 mm. long, the basal horn narrowly acicular, about twice as long as the hood and arching gradually over the anther head, the anther head cylindrical, about 2 mm. long and somewhat narrower. Follicles erect on erect pedicels, narrowly fusiform, 7–10 cm. long and 5–8 mm. thick, smooth, glabrous; seeds oval, about 5 mm. long, the white coma about 2.5 cm. long.

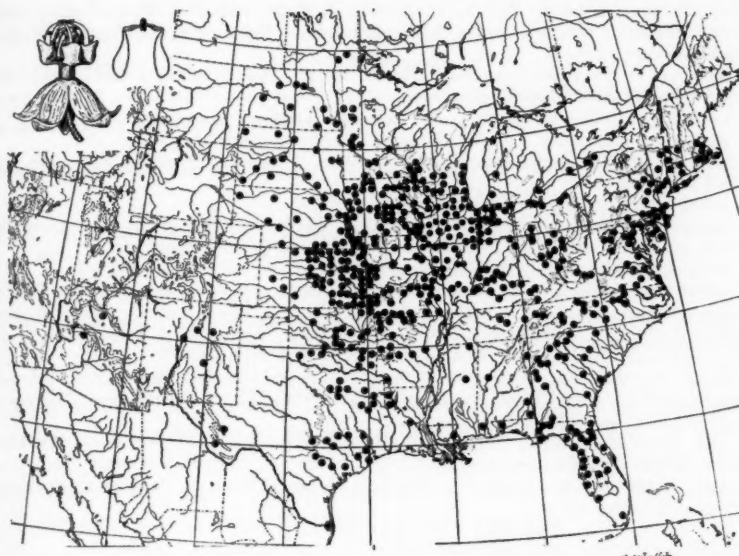
Prairies, thickets, and open woods, usually in rather dry soil; sand-dunes; spreading to roadsides and fence corners. Southern Ontario and Manitoba; Massachusetts to Florida and westward to North Dakota and Texas. Flowering from April to August.

CANADA: MANITOBA: Emerson and St. Boniface counties. ONTARIO: Essex, Norfolk, and Welland counties.

UNITED STATES:

ALABAMA: Barbour, Houston, Lee, Mobile, and Tuscaloosa counties.

ARKANSAS: Baxter, Benton, Carroll, Garland, Johnson, Marion, Miller, Montgomery, Prairie, Pulaski, Scott, Washington, and Yell counties.

Fig. 19. *Asclepias verticillata* L.

CONNECTICUT: Hartford and New Haven counties.

DELAWARE: Kent, New Castle, and Sussex counties.

FLORIDA: Alachua, Citrus, Clay, Dade, Dixie, Duval, Franklin, Gadsden, Hernando, Hillsborough, Lake, Lee, Leon, Levy, Liberty, Manatee, Marion, Osceola, Pasco, Polk, Putnam, Santa Rosa, Suwanee, and Volusia counties.

GEORGIA: Clarke, Cobb, Coweta, DeKalb, Floyd, Fulton, Hall, Jenkins, Long, Meriwether, Oglethorpe, Richmond, Stephens, Taylor, and Thomas counties.

ILLINOIS: Adams, Bureau, Carroll, Cass, Champaign, Christian, Cook, DeKalb, Douglas, Edgar, Effingham, Fayette, Ford, Hancock, Iroquois, Jackson, Kankakee, Knox, LaSalle, Lee, Livingston, Logan, McDonough, McLean, Macon, Macoupin, Madison, Mason, Menard, Ogle, Peoria, Piatt, Pope, Putnam, Richland, St. Clair, Stark, Union, Vermilion, Will, Witt, and Woodford counties.

INDIANA: Benton, Cass, Clark, Clinton, Crawford, Daviess, Delaware, Elkhart, Fulton, Gibson, Harrison, Jasper, Knox, Kosciusko, LaGrange, Lake, LaPorte, Marshall, Miami, Montgomery, Newton, Noble, Orange, Perry, Porter, Pulaski, St. Joseph, Spencer, Starke, Steuben, Tippecanoe, Vermillion, Warren, Wayne, and White counties.

IOWA: Allamakee, Black Hawk, Boone, Carroll, Cerro Gordo, Cherokee, Chickasaw, Clay, Clayton, Clinton, Crawford, Dallas, Decatur, Des Moines, Dickinson, Emmet, Fayette, Floyd, Greene, Guthrie, Harrison, Henry, Ida, Jackson, Johnson, Lee, Linn, Madison, Mahaska, Muscatine, Marshall, Monona, O'Brien, Page, Palo Alto, Polk, Pottawattamie, Poweshiek, Sioux, Story, Union, Van Buren, Wapello, Warren, Winneshiek, Woodbury, and Wright counties.

KANSAS: Allen, Anderson, Atchison, Barton, Butler, Chase, Chautauqua, Cherokee, Clay, Cloud, Cowley, Crawford, Dickinson, Doniphan, Douglas, Finney, Ford, Franklin, Geary, Greenwood, Harvey, Jackson, Jewell, Johnson, Labette, Leavenworth, Lincoln, Linn, Lyon, McPherson, Marshall, Miami, Montgomery, Morris, Nemaha, Neosho, Norton,

Osage, Osborne, Ottawa, Phillips, Pottawatomie, Reno, Republic, Riley, Rooks, Rush, Saline, Sedgwick, Shawnee, Smith, Stafford, Sumner, Wabaunsee, Washington, Wichita, and Wyandotte counties.

KENTUCKY: Edmonson, Henderson, Lewis, Mercer, Nelson, Ohio, Pulaski, Rockcastle, Union, Warren, and Whitley counties.

LOUISIANA: Caddo, DeSoto, Rapides, and Saint Tammany counties.

MARYLAND: Baltimore, Caroline, Carroll, and Montgomery counties.

MASSACHUSETTS: Barnstable, Bristol, Franklin, Middlesex, Norfolk, Plymouth, and Suffolk counties.

MICHIGAN: Kent and Van Buren counties.

MINNESOTA: Becker, Brown, Chippewa, Clay, Faribault, Houston, Jackson, Kandiyohi, Mower, Nicollet, Otter Tail, Pope, Ramsey, Swift, and Winona counties.

MISSISSIPPI: Alcorn and Oktibbeha counties.

MISSOURI: Atchison, Barry, Barton, Boone, Butler, Cass, Cedar, Dent, Franklin, Gentry, Greene, Hickory, Holt, Iron, Jackson, Jasper, Jefferson, Knox, Laclede, Linn, Madison, McDonald, Oregon, Ozark, Pike, Phelps, Pulaski, Ralls, Reynolds, St. Francois, St. Louis, Saline, Scotland, Stone, Taney, Washington, and Worth counties.

NEBRASKA: Antelope, Cass, Cherry, Custer, Dodge, Douglas, Gage, Holt, Jefferson, Keith, Knox, Lancaster, Lincoln, Nemaha, Nuckolls, Otoe, Platte, Red Willow, Richardson, Sioux, Washington, and Webster counties.

NEW JERSEY: Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Passaic, Salem, and Somerset counties.

NEW YORK: Albany, Columbia, Dutchess, Nassau, Niagara, Rensselaer, Rockland, Suffolk, and Ulster counties.

NORTH CAROLINA: Alexander, Ashe, Buncombe, Durham, Forsyth, Granville, Madison, Montgomery, Orange, Polk, Randolph, Rowan, Wake, and Wilkes counties.

NORTH DAKOTA: Barnes, Benson, Dickey, Dunn, Pierce, Ransom, Richland, and Ward counties.

OHIO: Adams, Athens, Clark, Cuyahoga, Erie, Fairfield, Greene, Jackson, Lake, Logan, Lucas, Meigs, Ottawa, Ross, and Scioto counties.

OKLAHOMA: Alfalfa, Cherokee, Cleveland, Comanche, Craig, Creek, Garvin, Grady, Hughes, Jackson, Latimer, Le Flore, Logan, McCurtain, Major, Miami, Muskogee, Oklahoma, Ottawa, Payne, Pottawatomie, and Pushmataha counties.

PENNSYLVANIA: Adams, Berks, Chester, Delaware, Lackawanna, Lancaster, Luzerne, Monroe, and Pike counties.

RHODE ISLAND: Kent and Providence counties.

SOUTH CAROLINA: Aiken, Anderson, Beaufort, Greenville, Lancaster, and Lexington counties.

SOUTH DAKOTA: Brookings, Brule, Charles Mix, Clay, Corson, Fall River, Haakon, Harding, Kingsbury, Pennington, Spink, Stanley, Walworth, and Washabaugh counties.

TENNESSEE: Anderson, Cumberland, Davidson, Knox, and Rutherford counties.

TEXAS: Anderson, Bastrop, Bexar, Brazos, Cameron, Cherokee, Dallas, Denton, De Witt, Fort Bend, Galveston, Gillespie, Gregg, Harris, Jackson, Jeff Davis, Johnson, Milam, Parker, Presidio, Rusk, Tarrant, Travis, Walker, Wilson, and Wood counties.

VIRGINIA: Arlington, Bedford, Campbell, Essex, Greensville, James City, Loudoun, Louisa, Mecklenburg, Prince William, Princess Anne, Shenandoah, and Sussex counties.

WEST VIRGINIA: Cabell, Grant, Hampshire, Hardy, Monroe, Raleigh, Summers, and Wayne counties.

WISCONSIN: Columbia, Crawford, Dane, Grant, Green, Kenosha, La Crosse, Lafayette, Milwaukee, Ozaukee, Sauk, Sheboygan, Trempealeau, and Walworth counties.

Superficially one of the most homogenous of species, *A. verticillata*, none the less, shows an interesting geographical variation in the margin of the minute corona hoods: the more eastern populations have hoods with rather sharp marginal lobes; but toward the west, where the species approaches the range of *A. sub-*

verticillata, the marginal lobes become broader and less prominent in the manner of the more simple oval hoods of the latter species (and in fact of all other species of INCARNATAE). This variation, which may indicate introgression of *A. verticillata* with *A. subverticillata*, could be measured rather precisely and probably would lend itself nicely to biometric analysis.

14. *ASCLEPIAS PUMILA* (A. Gray) Vail, in Britton & Brown, Illustr. Fl. 3:12. 1898.

Asclepias verticillata var. *pumila* A. Gray, in Proc. Amer. Acad. 12:71. 1877. [T.: Fendler 45, MO!]

Herbaceous perennials from rather deep rootstalks. Stems caespitose from the crown, simple or branching infrequently below ground level, relatively slender, 0.5–3.0 dm. tall, minutely puberulent generally. Leaves spirally approximate and very crowded or the lowest occasionally verticillate, sessile, filiform and strictly ascending, 2–4 cm. long and about 1 mm. broad, usually strongly revolute, glabrous or essentially so. Inflorescences subterminal, corymbosely clustered at the uppermost nodes, several-flowered; peduncles 1.0–1.5 cm. long; pedicels slender, about 1 cm. long. Flowers small; calyx lobes lance-trigonal, about 1 mm. long, scatteringly pilosulose to nearly glabrous; corolla reflexed-rotate, white or faintly suffused with rose or yellowish green, the lobes 2–3 mm. long; gynostegium narrowly stipitate, greenish white, the column cylindrical, about 1 mm. long and broad, the hoods cucullate, broadly oval, about 1.5 mm. long, the basal horn narrowly acicular,

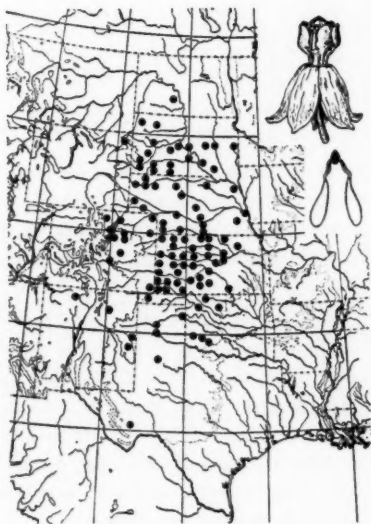


Fig. 20. *Asclepias pumila* (A. Gray) Vail

almost twice longer than the hood and gradually arching over the anther head, the anther head cylindric, about 1.25 mm. long and 1 mm. broad. Follicles erect on erect pedicels, narrowly fusiform, 4–8 cm. long, about 6 mm. broad; seeds broadly oval, 4–6 mm. long, the white coma about 2.5 cm. long.

Great Plains, from North Dakota to Texas and westward to Wyoming and New Mexico; poisonous to stock. Flowering from June to September.

UNITED STATES:

COLORADO: Adams, Arapahoe, Baca, Boulder, Denver, El Paso, Fremont, Jefferson, Larimer, Sedgwick, Weld, and Yuma counties.

KANSAS: Barton, Cheyenne, Cloud, Decatur, Dodge, Edwards, Ellis, Ellsworth, Finney, Ford, Gove, Graham, Grant, Gray, Greeley, Hamilton, Haskell, Hodgeman, Kiowa, Logan, Marion, Meade, Morton, Ness, Osborne, Pawnee, Phillips, Pratt, Rawlins, Republic, Riley, Rook, Russell, Saline, Scott, Sheridan, Smith, Stafford, Stanton, Stevens, Thomas, Trego, Wallace, and Wichita counties.

NEBRASKA: Banner, Box Butte, Buffalo, Chase, Cherry, Cheyenne, Custer, Dawes, Dixon, Dundy, Franklin, Holtz, Kearney, Lancaster, Lincoln, Red Willow, Sarpy, Sheridan, Sioux, and Thomas counties.

NEW MEXICO: Curry, Mora, Rio Arriba, and Roosevelt counties.

NORTH DAKOTA: Morton County.

OKLAHOMA: Cimarron, Comanche, Garfield, Greer, Kiowa, Woods, and Woodward counties.

SOUTH DAKOTA: Beadle, Brookings, Brule, Custer, Douglas, Fall River, Haakon, Hand, Harding, Hughes, Lyman, Meade, Pennington, Perkins, Shannon, Stanley, Todd, Washa-
baugh, and Washington counties.

TEXAS: Brewster, Hemphill, Lubbock, Potter, and Randall counties.

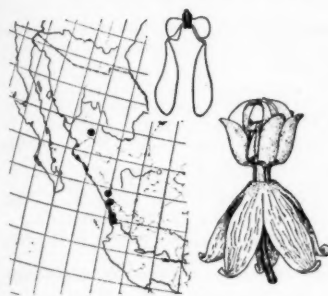
WYOMING: Crook County.

Slight development of obtuse marginal lobes to the hoods may be indicative of occasional hybridization with *A. verticillata* in the east.

15. *ASCLEPIAS LEPTOPUS* I. M. Johnston, in Proc. Cal. Acad. Sci. Ser. IV, 12:1127. 1924. [T.: Johnston 4377, CAS!]

Asclepias suffrutex Standl. in Field Mus. Publ. Bot. 22:45. 1940. [T.: Gentry 2388, MO!]

Suffruticose perennials or subshrubs. Stems very slender, 3–4 dm. tall, branching repeatedly at least toward the persistent woody base, glabrous. Leaves opposite, sessile, relatively distant and caducous soon after flowering, filiform, lax, 4–6 cm. long, about 1 mm. broad, glabrous, revolute. Inflorescences subterminal from few of the uppermost nodes, few-flowered; peduncle 0.5–1.2 cm. long; pedicels slender, 1–2 cm. long. Flowers rather small; calyx lobes narrowly trigonal, 1.5–2.5 mm. long, glabrous; corolla reflexed-rotate, white, the lobes 4.5–7.0 mm. long; gynostegium narrowly stipitate, white, the column cylindrical, about 1 mm. long and broad, the hoods cucullate-elliptic, 3–5 mm. long, the basal horn narrowly acicular, about as long as the hood and arching over the anther head, the anther head cylindric, about 2.0–2.5 mm. long and broad. Follicles pendulous or subpendulous, narrowly fusiform, 4–6 cm. long, smooth, glabrous; seeds broadly oval, about 2.5 mm. long, the pale tawny coma about 1 cm. long.

Fig. 21. *Asclepias leptopus* I. M. Johnston

Crevices of rock and tufa and in canyons; northwestern Mexico. Flowering from July to December.

MEXICO: CHIHUAHUA: Río Mayo. SINALOA: Culiacan, Cerro Colorado. SONORA: San Bernardo, San Carlos Bay, Guaymas, Hermosillo.

The twiggy, glaucous, *Ephedra*-like plants of this species closely resemble certain other milkweeds native to this region, such as *A. masonii*, *A. subaphylla*, *A. albicans*, and *A. subulata*, when out of flower.

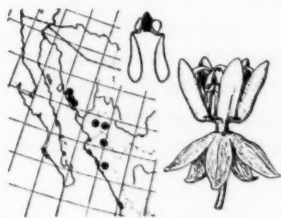
16. *ASCLEPIAS GENTRYI* Standl. in Field Mus. Publ. Bot. 22:45. 1940. [T.: *Gentry 2330, MO!*]

Herbaceous perennials from rather superficial rootstalks. Stems usually simple, 1-2 dm. tall, minutely puberulent in decurrent lines from the nodes. Leaves opposite, shortly petiolate, persistent, linear to linear-lanceolate, acuminate, the base acute to obtuse, 3-8 cm. long, 2-5 mm. broad, membranaceous, inconspicuously pilosulose to glabrate, membranaceous, usually somewhat revolute; petioles 1-3 mm. long. Inflorescences terminal and subterminal from the uppermost nodes, few- to several-flowered; peduncles 2-3 cm. long; pedicels 1-5 cm. long, very slender. Flowers moderately large; calyx lobes lance-trigonal, 2-3 mm. long, glabrous; corolla reflexed-rotate, bright red to pinkish, the lobes 6-7 mm. long; gynostegium narrowly stipitate, yellow or slightly pinkish, the column cylindrical, 1.0-1.5 mm. long, 0.5-1.0 mm. broad, the hoods oblong-elliptic, 3-4 mm. long, the horn acicular, adnate to near the tip of the hood and slightly longer than it, gradually arching over the anther head, the anther head about 2 mm. long and broad. Follicles unknown.

Barren slopes and hillsides, amongst short grass; western Mexico from Chihuahua to Nayarit. Flowering in July and August.

MEXICO: CHIHUAHUA: Río Mayo. NAYARIT: Punta Mita, Tepic. SINALOA: Rosario, Colomos.

This is a very peculiar species of uncertain affinity in the absence of fruit. The strongly adnate horns are unusual for the INCARNATAE, but most unusual for the entire genus are the broadly triangular translator arms which suggest those of the genus *Oxypetalum*.

Fig. 22. *Asclepias gentryi* Standl.

Series 2. TUBEROSAE

KEY TO THE SPECIES

- a. Plants conspicuously hirsutulous or hispid generally; leaves irregularly approximate; corolla orange, rarely yellow or red. Southern Ontario; New Hampshire to Florida and westward to South Dakota, Utah, and Arizona; Tamaulipas to Chihuahua.....17. *A. tuberosa*
- aa. Plants essentially glabrous; leaves opposite; corolla red or purplish.
 - b. Hoods acute, about three times as long as the anther head; leaves broadly ovate to lanceolate. New Jersey to Georgia and westward to southeastern Texas.....18. *A. rubra*
 - bb. Hoods broadly rounded, about twice as long as the anther head; leaves linear-lanceolate. New Jersey to Florida and westward to southeastern Texas.....19. *A. lanceolata*

From the standpoint of floral structure these three species probably are closely related. Since their vegetative aspect is so different, however, perhaps it might be better to erect at least a separate subseries for *A. tuberosa*. So few species are involved and so little is actually known of the phylogeny of *Asclepias*, particularly in the role of parallelism of development of the gynostegium, on the other hand, that little would be gained.

17. *ASCLEPIAS TUBEROSA* L. Sp. Pl. 217. 1753. [T.: Linn. Herb. London, no. 310.41, photo!]

Herbaceous perennials from a deep, woody rootstalk. Stems usually stout and clustered from the crown, usually branching only at the inflorescence, 2–9 dm. tall, conspicuously hirsutulous or hispid generally. Leaves irregularly approximate, usually crowded, rather shortly petiolate, extremely variable, very narrowly lanceolate to very broadly oblanceolate, apex acuminate to rounded, base cuneate to broadly cordate, 3–11 cm. long, 0.3–3.0 cm. broad, firmly membranaceous and occasionally irregularly crisped-revolute, more or less conspicuously hirsutulous particularly beneath; petioles 1–5 mm. long. Inflorescence of 1 to several terminal and subterminal helicoid branches bearing few to numerous umbelliform cymes at the nodes of the more or less reduced and usually opposite leaves, the cymes several-to many-flowered. Flowers moderately large; calyx lobes lance-trigonal, 2–3 mm. long, minutely hirsutulous; corolla reflexed-rotate, usually orange or occasionally reddish or yellow or red, the lobes 7–8 mm. long; gynostegium usually orange, rarely yellow, the column narrowly obconic, about 2 mm. long and 1.5 mm. broad, the hoods cucullate, lanceolate, 4–5 mm. long, the horn basal, narrowly acicular, slightly longer than the hoods, gradually arching over the anther head, the anther head cylindrical, about 2 mm. long and broad. Follicles erect on deflexed pedicels, narrowly fusiform, 8–15 cm. long, 1.0–1.5 cm. broad, smooth, pilosulose; seeds broadly oval, 5–7 mm. long, the white coma 3–4 cm. long.

KEY TO THE SUBSPECIES

- Leaves typically obovate to oblanceolate and cuneate at the base, varying to oblong or elliptic, the margins usually flat. New Hampshire to northern Florida (there merging with ssp. *rolfsii*) westward to the Alleghenies (there merging with ssp. *interior*)....17a. *A. tuberosa tuberosa*
- Leaves typically hastate, the margins usually crispate-revolute. Florida to Georgia (there merging with ssp. *tuberosa*) and westward along the Gulf plain to Alabama (there merging with ssp. *tuberosa* and *interior*).....17b. *A. tuberosa rolfsii*

Leaves lanceolate to ovate, varying to oblong or elliptic, the margins usually flat.

Leaves typically deeply cordate. Ozark upland eastward to the Alleghenies (there merging with *ssp. tuberosa*), southward to the Gulf plain (there merging with *ssp. rolfsii*), and in an arc westward and northward from Texas to northern Michigan (there merging with *ssp. terminalis*)17c. *A. tuberosa interior*

Leaves typically obtuse to truncate at the base, varying to slightly cordate. Western periphery of the species distribution from Tamaulipas northwestward to southern Utah, and eastward to Colorado, South Dakota, southern Minnesota, Wisconsin, and northern Michigan (merging in an arc generally eastward and southward with *ssp. interior*)17d. *A. tuberosa terminalis*

The complicated population patterns of *A. tuberosa* have been the subject of rather detailed biometric studies (Woodson, in Ann. Missouri Bot. Gard. 34:353, 1947; Proc. Nat. Acad. Sci. 39:74, 1953) which are being continued at present. Although the existence of the subspecies is readily demonstrable statistically and easily observed in relatively homozygous individuals, a large part of the species population as a whole consists of the very broad commissures where introgression is extremely active. Here exact assignment of individual plants to any given subspecies frequently is quite impossible.

Since these commissures evidently are genoclines, I have sought to cut the Gordian knot in the naming of their specimens by labelling them "*Asclepias t. cl.*"

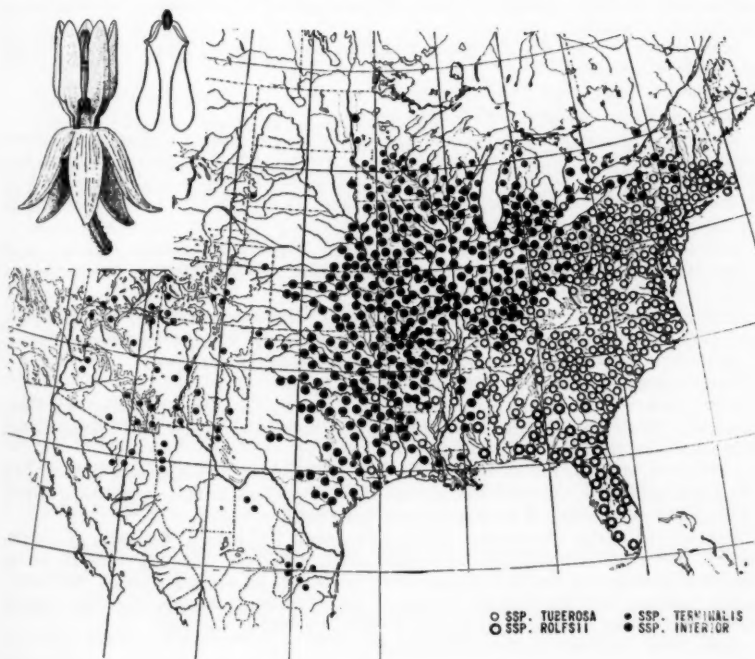


Fig. 23. *Asclepias tuberosa* L.

interior-tuberosa", "*Asclepias t. cl. rolfsii-tuberosa*", or whatever the case appears to be. In the geographic citations which follow, however, this device is not used as being too ambiguous. The result is a frequently too arbitrary assignment of county records to the various subspecies, which may leave the reader with a scarcely more fortunate mis-impression of genetic stability within the populations. It is, nevertheless, more in harmony with current taxonomic practice.

17a. ASCLEPIAS TUBEROSA ssp. TUBEROSA

Asclepias decumbens L. Sp. Pl. 216. 1753, ex char.

Asclepias floridana Lam. Encycl. 1:284. 1783. [T.: Herb. Lam., Paris, photo!]

Asclepias lutea Raf. Med. Repos. N. Y. 5:361. 1808, ex char.

Asclepias tuberosa β *decumbens* (L.) Pursh, Fl. Amer. Sept. 1:184. 1814.

Dry fields, hillsides, thickets, and open woods; sand dunes. Southern Ontario; New Hampshire to northern Florida and westward to Michigan and Tennessee (merging with ssp. *rolfsii* in the south and with ssp. *interior* in the west). Flowering from April to September.

CANADA: ONTARIO: Carleton and Welland counties.

UNITED STATES:

ALABAMA: Barbour, Cullman, Elmore, Franklin, Houston, Jackson, Lee, Mobile, and Montgomery counties.

CONNECTICUT: Fairfield, Hartford, Middlesex, New Haven, New London, Tolland, and Windham counties.

DELAWARE: Kent, New Castle, and Sussex counties.

FLORIDA: Duval, Holmes, and Nassau counties.

GEORGIA: Bibb, Charlton, Chatham, Clarke, Dade, De Kalb, Dougherty, Effingham, Fannin, Floyd, Forsyth, Fulton, Gwinnett, Hall, Heard, Jefferson, Jenkins, Lamar, Lincoln, Long, Lowndes, McDuffie, McIntosh, Meriwether, Muscogee, Oglethorpe, Pickens, Quitman, Rabun, Richmond, Stephens, Terrell, Union, Walker, White, and Wilkes counties.

ILLINOIS: Williamson County.

KENTUCKY: Calloway, Marshall, McCreary, and Washington counties.

MARYLAND: Allegany, Caroline, Cecil, Garrett, Harford, Montgomery, Prince Georges, Queen Anne, Talbot, and Wicomico counties.

MASSACHUSETTS: Barnstable, Berkshire, Bristol, Dukes, Essex, Franklin, Hampden, Hampshire, Middlesex, Nantucket, Norfolk, Plymouth, and Worcester counties.

MISSISSIPPI: Harrison, Jackson, Lauderdale, and Oktibbeha counties.

NEW HAMPSHIRE: Cheshire and Hillsborough counties.

NEW JERSEY: Atlantic, Bergen, Burlington, Camden, Cape May, Cumberland, Essex, Gloucester, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Passaic, Salem, Somerset, Sussex, and Warren counties.

NEW YORK: Albany, Bronx, Cayuga, Columbia, Dutchess, Fulton, Kings, Nassau, New York, Oneida, Ontario, Orange, Queens, Rensselaer, Richmond, Rockland, Saratoga, Seneca, Suffolk, Sullivan, Warren, Washington, and Westchester counties.

NORTH CAROLINA: Alexander, Bertie, Buncombe, Cabarrus, Catawba, Cherokee, Chowan, Cleveland, Cumberland, Currituck, Dare, Davidson, Durham, Forsyth, Gates, Granville, Graham, Greene, Guilford, Harnett, Haywood, Henderson, Jackson, McDowell, Macon, Madison, Martin, Onslow, Orange, Polk, Randolph, Rowan, Sampson, Stanly, Surry, Swain, Union, Wake, Washington, Wilkes, and Wilson counties.

OHIO: Erie, Jackson, and Richland counties.

PENNSYLVANIA: Adams, Allegheny, Armstrong, Beaver, Bedford, Berks, Bradford, Bucks, Butler, Center, Chester, Cumberland, Delaware, Huntingdon, Juniata, Lackawanna,

Lancaster, Lebanon, Lehigh, Luzerne, Mifflin, Montgomery, Montour, Perry, Philadelphia, Schuylkill, Snyder, Susquehanna, Warren, Washington, Westmoreland, Wyoming, and York counties.

RHODE ISLAND: Providence and Washington counties.

SOUTH CAROLINA: Abbeville, Aiken, Anderson, Beaufort, Berkeley, Charleston, Darlington, Florence, Horry, Lancaster, Lexington, Oconee, Pickens, and Williamsburg counties.

TENNESSEE: Anderson, Bledsoe, Blount, Campbell, Cocke, Davidson, Franklin, Grainger, Knox, Monroe, McNary, Sevier, and Union counties.

VERMONT: Bennington and Windham counties.

VIRGINIA: Allegheny, Bath, Bedford, Cumberland, Dinwiddie, Fauquier, Frederick, Giles, Gloucester, Greensville, Henrico, James City, Nansemond, Norfolk, Northumberland, Patrick, Prince William, Princess Anne, Roanoke, Rockbridge, Rockingham, Southampton, Sussex, Tazewell, and Warren counties.

WEST VIRGINIA: Berkeley, Cabell, Gilmer, Grant, Hardy, Harrison, Jefferson, Kanawha, Marion, Mercer, Mineral, Monongalia, Monroe, Morgan, Ohio, Pendleton, Preston, Raleigh, Randolph, Ritchie, Tyler, Upshur, Wetzel, and Wood counties.

17b. *ASCLEPIAS TUBEROSA* ssp. *ROLFSII* (Britton) Woodson, in Ann. Missouri Bot. Gard. 31:368. 1944.

Asclepias Rolfii Britton, in Small, Fl. Southeast. U. S. 943, 1336. 1903. [T.: Britton s. n., NY!]

Asclepias tuberosa var. *Rolfii* (Britton) Shinnars, in Field & Lab. 17:89. 1949.

Sandy and rocky soil, fields, pine barrens, and flatwoods. Florida and southern Georgia to South Carolina and Mississippi (merging northward with ssp. *tuberosa* and northwestward with ssp. *interior*). Flowering from February to August.

UNITED STATES:

ALABAMA: Houston, Macon, and Russell counties.

FLORIDA: Alachua, Baker, Bradford, Brevard, Citrus, Clay, Collier, Columbia, Dade, Dixie, Duval, Gadsden, Gilchrist, Highlands, Hillsborough, Holmes, Jefferson, Lee, Leon, Levy, Liberty, Manatee, Marion, Okaloosa, Okeechobee, Orange, Osceola, Pinellas, Polk, Putnam, Sumter, Suwanee, and Volusia counties.

GEORGIA: Bulloch, Charlton, Dougherty, Emanuel, Laurens, Lowndes, McIntosh, and Macon counties.

MISSISSIPPI: Scott County.

17c. *ASCLEPIAS TUBEROSA* ssp. *INTERIOR* Woodson, in Ann. Missouri Bot. Gard. 31:368. 1944. [T.: A. Hayden 3195, MO!]

Asclepias tuberosa var. *flexuosa* James, in Bot. Gaz. 13:271. 1888, ex char. [T.: Miss Mobr s. n.]

Asclepias tuberosa f. *lutea* Clute, in Amer. Bot. 18:73. 1912, ex char.

Asclepias tuberosa f. *flavescens* Farwell, in Papers Mich. Acad. Sci. 2:36. 1923, ex char. [T.: Farwell 5875]

Asclepias tuberosa f. *bicolor* Standl. in Rhodora 32:33. 1930. [T.: Standley 57304, F!]

Asclepias tuberosa var. *interior* (Woodson) Shinnars, in Field & Lab. 17:89. 1949.

Prairies, glades, fields, thickets, and open woods. Southern Ontario; western New York southeastward to Mississippi and westward to Minnesota, Nebraska, Kansas, Oklahoma, and Texas (merging eastward with ssp. *tuberosa*, southward with ssp. *rolfsii*, and westward with ssp. *terminalis*). Flowering from May to September.

CANADA: ONTARIO: Bruce, Carleton, Essex, Hastings, Huron, Kent, Lambton, Middlesex, Ontario, Simcoe, Wentworth, and York counties.

UNITED STATES:

ARKANSAS: Baxter, Benton, Boone, Clark, Cleburne, Cleveland, Craighead, Drew, Faulkner, Garland, Greene, Hempstead, Hot Springs, Jefferson, Lawrence, Little River, Logan, Lonoke, Miller, Montgomery, Nevada, Phillips, Polk, Pope, Pulaski, Prairie, Saline, Searcy, Sevier, Sharp, Washington, and Yell counties.

CALIFORNIA: Colusa County (Princeton, introduced).

ILLINOIS: Adams, Calhoun, Champaign, Clay, Cook, Du Page, Effingham, Jefferson, Jackson, Kankakee, Lake, La Salle, Logan, McLean, Macon, Macoupin, Madison, Mason, Massac, Ogle, Peoria, Putnam, Rock Island, Stark, Vermilion, Winnebago, and Woodford counties.

INDIANA: Allen, Benton, Brown, Cass, Clark, Clinton, Crawford, Daviess, De Kalb, Elkhart, Fountain, Fulton, Greene, Jasper, Jennings, Knox, Kosciusko, Lagrange, Lake, La Porte, Lawrence, Marshall, Martin, Monroe, Newton, Noble, Owen, Pike, Porter, Pulaski, Putnam, St. Joseph, Stark, Steuben, Sullivan, Tippecanoe, Tipton, Union, Vermillion, Vigo, Wabash, Washington, Warren, Wells, White, and Whitley counties.

IOWA: Adair, Allamakee, Appanose, Benton, Carroll, Cerro Gordo, Chickasaw, Clay, Clinton, Crawford, Decatur, Dickinson, Douglas, Emmet, Fayette, Greene, Hamilton, Harrison, Henry, Humboldt, Johnson, Lee, Madison, Mitchell, Muscatine, Palo Alto, Pocahontas, Poweshiek, Ringgold, Shelby, Sioux, Story, Union, Van Buren, Webster, Winneshiek, and Wright counties.

KANSAS: Allen, Anderson, Atchison, Barton, Brown, Butler, Chautauqua, Cherokee, Cloud, Crawford, Custer, Ellis, Ellsworth, Franklin, Geary, Greenwood, Harvey, Jackson, Jefferson, Johnson, Labette, Leavenworth, Lincoln, Lyon, Marion, Marshall, Miami, Mitchell, Montgomery, Morris, Nemaha, Neosho, Osage, Osborne, Pottawatomie, Rice, Riley, Rooks, Russell, Saline, Sedgwick, Shawnee, Sumner, Trego, Wabaunsee, Washington, Whitford, Woodson, and Wyandotte counties.

KENTUCKY: Barren, Breckenridge, Caldwell, Graves, Logan, McCreary, Ohio, Taylor, and Warren counties.

LOUISIANA: Ascension, Bienville, Caddo, De Soto, Natchitoches, Rapides, St. Martins, and St. Tammany parishes.

MICHIGAN: Allegan, Berrien, Calhoun, Crawford, Eaton, Emmet, Grand Traverse, Hillsdale, Ingham, Ionia, Jackson, Kalamazoo, Kent, Lake, Lenawee, Livingston, Mason, Muskegon, St. Clair, St. Joseph, Van Buren, Wayne, and Washtenaw counties.

MINNESOTA: Benton, Brown, Chippewa, Chisago, Faribault, Goodhue, Hennepin, Houston, Isanti, Jackson, Kandiyohi, Nicollet, Olmstead, Ottertail, Polk, Ramsey, Rice, Scott, Sherburne, Stearns, Todd, Wabasha, Waseca, Winona, and Wright counties.

MISSISSIPPI: Choctaw, Grenada, Oktibbeha, Panola, Rankin, and Scott counties.

MISSOURI: Barry, Barton, Boone, Callaway, Cass, Chariton, Cooper, Daviess, Dent, Franklin, Greene, Grundy, Iron, Jasper, Jefferson, Johnson, Laclede, Lafayette, Lawrence, Lewis, Lincoln, McDonald, Madison, Marion, Morgan, Nodaway, Phelps, Pike, St. Clair, Ste. Genevieve, St. Louis, Stone, Taney, Wayne, and Wright counties.

NEBRASKA: Butler, Cass, Dodge, Douglas, Gage, Jefferson, Lancaster, Nemaha, Nuckolls, Otoe, Richardson, Saline, Sarpy, Saunders, Washington, and Webster counties.

NEW YORK: Cayuga, Chemung, Herkimer, Monroe, Niagara, Schenectady, Seneca, Tioga, Tompkins, and Wayne counties.

OHIO: Adams, Ashtabula, Auglaize, Brown, Butler, Carroll, Champaign, Cuyahoga, Defiance, Erie, Fairfield, Fayette, Greene, Lake, Licking, Logan, Lorain, Lucas, Madison, Miami, Montgomery, Perry, Portage, Richland, Ross, Stark, Summit, Williams, and Wyandot counties.

OKLAHOMA: Beckham, Caddo, Canadian, Carter, Cherokee, Choctaw, Cleveland, Coal, Comanche, Craig, Creek, Custer, Garfield, Grady, Greer, Haskell, Hughes, Jackson, Johnston, Kay, Kingfisher, Kiowa, Le Flore, Lincoln, Logan, Love, McLain, McCurtain, McIntosh, Mayes, Murray, Muskogee, Noble, Nowata, Oklahoma, Pawnee, Payne, Pittsburg, Pottawatomie, Pushmataha, Roger Mills, Rogers, Seminole, Tulsa, Wagoner, Washita, and Woods counties.

PENNSYLVANIA: Bradford, Lackawanna, Philadelphia, Snyder, Venango, and Warren counties.

SOUTH DAKOTA: Brookings, Lincoln, and Union counties.

TENNESSEE: Davidson County.

TEXAS: Anderson, Angelina, Bastrop, Bexar, Bowie, Brown, Brazos, Callahan, Cass, Cherokee, Childress, Comanche, Denton, De Witt, Eastland, Ellis, Erath, Fayette, Galveston, Goliad, Gonzales, Grayson, Gregg, Hall, Harris, Harrison, Henderson, Hill, Hood, Hopkins, Houston, Hunt, Jasper, Jefferson, Kerr, Lamar, Leon, Madison, Montague, Montgomery, Parker, Roberts, Tarrant, Taylor, Travis, Trinity, Upshur, Victoria, Walker, Washington, Wichita, Williamson, Wilson, Wise, and Wood counties.

WEST VIRGINIA: Hampshire and Wirt counties.

WISCONSIN: Adams, Barron, Brown, Burnett, Buffalo, Clark, Crawford, Dane, Dunn, Eau Claire, Grant, Green, Green Lake, Jackson, Juneau, La Crosse, Lafayette, Marinette, Milwaukee, Oconto, Portage, Racine, Rock, Shawano, Vernon, Walworth, Waukesha, Waupaca, Waushara, Winnebago, and Wood counties.

17d. *ASCLEPIAS TUBEROSA* ssp. *TERMINALIS* Woodson, in Proc. Nat. Acad. Sci. 39:79. 1953. [T.: *L. S. Ehlers 13954, MO!*]

Prairies, open oak and pine woods, canyons, stream sides and arroyos. Western Texas to Arizona and southern Utah and northeastward to Colorado, South Dakota, Minnesota, and northern Wisconsin and Michigan (merging generally eastward with ssp. *interior*); northern Mexico. Flowering from June to September.

UNITED STATES:

ARIZONA: Apache, Cochise, Coconino, Gila, Graham, Maricopa, Mohave, Navajo, Pima, and Yavapai counties.

COLORADO: Denver, El Paso, Fremont, La Plata, Mesa, Montrose, Pueblo, and Yuma counties.

MICHIGAN: Cheboygan, Emmet, and Grand Traverse counties.

MINNESOTA: Benton, Mille Lacs, Ramsey, Sherburne, Stearns, and Wabasha counties.

NEW MEXICO: Bernalillo, Catron, Dona Ana, Eddy, Grant, Hidalgo, Lincoln, Otero, Sandoval, San Juan, San Miguel, Sierra, Socorro, and Union counties.

OKLAHOMA: Cimarron County.

SOUTH DAKOTA: Fall River County.

TEXAS: Culberson, Hutchinson, Jeff Davis, Parker, Taylor, and Tom Green counties.

UTAH: Garfield, Kane, San Juan, and Washington counties.

WISCONSIN: Burnett, Eau Claire, Marinette, Pierce, and Polk counties.

MEXICO: CHIHUAHUA: Colonia García, Colonia Juárez, Tosanachic, Chuichupa, Chuchuchupa. COAHUILA: Villa Acuña, Monclova. NUEVO LEON: Dulces Nombres, Villa Santiago, Montemorelos, Monterrey, Galeana, Río Ramos. SONORA: Sierra de El Tigre, Bavispe, Sierra del Pajarito. TAMAULIPAS: San Lucas, Jaumave, San José.

The naming of ssp. *terminalis* is the result of afterthought since the publication of my first paper of leaf variation in *A. tuberosa* (Ann. Missouri Bot. Gard. 34:353-432. 1947). In that paper, phenocontour maps revealed a striking series of isophenes radiating from the Ozark upland, with respect to the leaf base of *A. t. interior*. In the center of the distribution leaves of that subspecies are deeply cordate; but radiating in remarkably concentric waves in broad arcs roughly westward from Lake Erie to north-central Mexico, the leaf bases become less and less deeply cordate, to truncate and finally obtuse. No taxonomic designation was given the peripheral population at that time, however.

Now it seems best to do so, particularly since a "crest of variability" midway between the distributions of the two extremes shows plainly that the intergradation observed is the result of introgression and thus a genocline and not a simple geocline or ecocline.

18. *ASCLEPIAS RUBRA* L. Sp. Pl. 217. 1753. [T.: Linn. Herb. London, no. 370.39, photo!]

Asclepias cordata Walt. Fl. Carol. 105. 1788, ex char.

Asclepias laurifolia Michx. Fl. Bor. Amer. 1:117. 1803, ex char.

Asclepias acuminata Pursh, Fl. Amer. Sept. 1:182. 1816, ex char.

Asclepias periplocaefolia Nutt. Gen. North Amer. Pl. 1:167. 1818, ex char.

Asclepias rubra var. (Michx.) *laurifolia* Harper, in Bull. Torrey Bot. Club 30:339. 1903.

Herbaceous perennials. Stems rather slender, 4–10 dm. tall, simple, glabrous or very inconspicuously pilosulose in decurrent lines from the nodes. Leaves opposite, sessile or subsessile, broadly ovate to narrowly lanceolate, apex acute to acuminate, base rounded to somewhat cordate, 5–16 cm. long, 1.0–6.5 cm. broad, firmly membranaceous, glabrous, dark green above, glaucous beneath. Inflorescences terminal and lateral from the uppermost nodes, commonly paired when terminal, several- to many-flowered; peduncles 3–10 cm. long; pedicels 1.0–1.5 cm. long. Flowers moderately large; calyx lobes lance-trigonal, about 3 mm. long, glabrous; corolla reflexed-rotate, dull red to purplish or lavender, the lobes 8–9 mm. long;



Fig. 24. *Asclepias rubra* L.

gynostegium stipitate, usually pinkish cream or purplish, the column cylindrical, about 2 mm. long and broad, the hoods lanceolate, acute, 6–7 mm. long, the basal horn narrowly acicular, somewhat shorter than the hoods, gradually arching over the anther head, the anther head narrowly conic, about 3 mm. long and broad, with entire or very inconspicuously notched wings. Follicles erect on deflexed pedicels, rather narrowly fusiform, about 8–12 cm. long and 1.5 cm. thick, smooth, glabrous; seeds broadly oval, about 7 mm. long, the white coma about 4 cm. long.

Bogs, marshes, wet meadows, and low pine barrens. New Jersey to southern Georgia; southern Alabama, Louisiana, and southeastern Texas. Flowering from May to August.

UNITED STATES:

ALABAMA: Mobile County.

DELAWARE: New Castle and Sussex counties.

GEORGIA: Sumter County.

LOUISIANA: Natchitoches and Rapides parishes.

MARYLAND: Prince Georges and Worcester counties.

NEW JERSEY: Atlantic, Burlington, Cape May, Gloucester, Hunterdon, Middlesex, and Ocean counties.

TEXAS: Anderson, Houston, Robertson, Smith, and Wood counties.

19. *ASCLEPIAS LANCEOLATA* Walt. Fl. Carol. 105. 1788, ex char.

Asclepias serpentaria Raf., Fl. Ludov. 52. 1817, ex char.

Asclepias paupercula Michx. Fl. Bor.-Amer. 1:118. 1803, ex char.

Asclepias lanceolata var. *paupercula* (Michx.) Fernald, in *Rhodora* 37:438. 1935.

Asclepias lanceolata var. *paupercula* f. *flaviflora* Fernald, loc. cit. 45:458. 1943. [T.: Fernald & Long 14,390, GH!]

Herbaceous perennials from rather tuberous rootstalks. Stems relatively slender, simple, 5–12 dm. tall, glabrous or essentially so. Leaves opposite, linear-lanceolate,



Fig. 25. *Asclepias lanceolata* Walt.

narrowly acuminate, acute to obtuse at the base, 7–25 cm. long, 0.5–1.7 cm. broad, firmly membranaceous, glabrous, somewhat glaucous beneath. Inflorescences terminal, solitary or paired, few-flowered; peduncles 1.5–7.5 cm. long; pedicels 1–2 cm. long. Flowers moderately large; calyx lobes lance-trigonal, 2.5–4.0 mm. long; corolla reflexed-rotate, dull red, the lobes 9–10 mm. long; gynostegium stipitate, yellow, orange, or reddish, the column cylindrical, about 2 mm. long and 1.5 mm. broad, the hoods broadly oblong, rounded at the tip, 5–6 mm. long, the basal horn narrowly acicular, somewhat shorter than the hood, arching over the anther head, the anther head narrowly conic, about 3 mm. long and 2.5 mm. broad, the wings conspicuously spurred at the base. Follicles erect on deflexed pedicels, narrowly fusiform, 8–10 cm. long, about 1 cm. thick, smooth, glabrous; seeds broadly oval, about 1 cm. long, the coma about 3.5 cm. long.

Brackish to fresh marshes, wet pine barrens, and low glades. Southern New Jersey to Florida and westward to eastern Texas. Flowering from May to August.

UNITED STATES:

ALABAMA: Mobile County.

DELAWARE: Kent and Sussex counties.

FLORIDA: Alachua, Baker, Bradford, Brevard, Broward, Calhoun, Charlotte, Citrus, Clay, Collier, Dade, Dixie, Duval, Flagler, Glades, Gulf, Hernando, Hillsborough, Lafayette, Lake, Lee, Levy, Manatee, Marion, Nassau, Osceola, Palm Beach, Pasco, Putnam, St. Johns, Taylor, Union, Volusia, and Washington counties.

GEORGIA: Brooks, Charlton, Glynn, Laurens, McIntosh, Sumter, and Wayne counties.

LOUISIANA: Calcasieu, Orleans, Rapides, and St. Tammany parishes.

MISSISSIPPI: Hancock, Harrison, Jackson, and Pearl River counties.

NORTH CAROLINA: Beaufort, Brunswick, Camden, Carteret, Chowan, Columbus, Currituck, Dare, Hyde, New Hanover, Pamlico, and Pasquotank counties.

NEW JERSEY: Cape May and Ocean counties.

SOUTH CAROLINA: Dorchester, Florence, Georgetown, Horry, Orangeburg, and Williamsburg counties.

TEXAS: Harris, Jefferson, and Orange counties.

VIRGINIA: Norfolk and Princess Anne counties.

It is rather remarkable that such closely related species as *A. rubra* and *A. lanceolata*, with so similar ranges and habitats and blooming at the same times of year, should maintain their genetic individualities so distinctly. Perhaps the differing anther wings provide the mechanical barriers to cross pollination.

Series 3. EXALTATAE

KEY TO THE SPECIES

- a. Column narrowly cylindric, as long as broad or somewhat longer.
 - b. Horn adnate to midway of the hood or below; leaves shortly petiolate to subsessile, ovate to ovate-lanceolate, subpalmately veined at the base. Tamaulipas to Sinaloa and southward to Veracruz and Guerrero20. *A. ovata*
 - bb. Horn adnate to near the tip of the hood; leaves rather long-petiolate, broadly elliptic, the venation typically pinnate throughout. Tamaulipas to Chiapas; Guatemala; Honduras; Nicaragua21. *A. similis*
- aa. Column shortly cylindrical to obconic, about half as long as broad.
 - b. Median lobe of the hoods gradually rounded and entire; plants moderately stout and caulescent, more or less setose-hispidulous generally; leaves shortly petiolate and cordate typically. Tamaulipas to Sinaloa and southward to Chiapas; Guatemala; El Salvador22. *A. contrayerba*

- bb. Median lobe of the hoods truncate and more or less deeply dentate or lacerate.
- c. Peduncles typically much shorter than the subtending leaves, chiefly lateral; hoods delicately petalaceous; flowers white or the corolla slightly tinged with purple without.
- d. Plants relatively stout; leaves broadly elliptic to ovate. Southern Ontario; Maine to northern Georgia and westward to Minnesota and Iowa.....23. *A. exaltata*
- dd. Plants relatively slender; leaves linear to filiform.
- e. Hoods about half longer than the anther head, broadly dentate; horn adnate to about midway of the hood; plants suffrutescent, essentially glabrous. Tam-
 aulipas to San Luis Potosi24. *A. coulteri*
- ee. Hoods about as long as the anther head, deeply lacerate; horn adnate the entire
 length of the hood; plants herbaceous, minutely puberulent. Southern New
 Mexico and Arizona; Chihuahua and San Luis Potosi.....25. *A. quinqueidentata*
- cc. Peduncles typically much longer than the subtending leaves, chiefly terminal or
 subterminal; hoods rather fleshy; flowers greenish, usually deeply suffused with
 reddish purple.
- d. Plants relatively stout, essentially glabrous; leaves deeply cordate, sessile and
 amplexicaul; flowers relatively large, about 1.5 cm. long from hood- to corolla
 lobe-tip. New Hampshire to northern Florida and westward to Nebraska and
 eastern Texas26. *A. amplexicaulis*
- dd. Plants relatively small and subscapose, more or less densely pubescent; leaves obtuse
 to rounded at the base, distinctly petiolate.
- e. Inflorescence subterminal; flowers relatively large, about 1.5 cm. long from hood-
 to corolla lobe-tip. Nuevo Leon to Puebla.....27. *A. virletii*
- ee. Inflorescences terminal; flowers relatively small, about 5 mm. long from hood-
 to corolla lobe-tip. Southern New Mexico (?); Coahuila, San Luis Potosi, and
 Zacatecas28. *A. scaposa*

20. *ASCLEPIAS OVATA* Mart. & Gal. in Bull. Acad. Roy. Brux. 11¹:363. 1844.
 [T.: *Galeotti 1554*, BR!]

Asclepias neglecta Hemsl. Biol. Centr.-Amer. Bot. 2:325. 1881. [T.: *Bourgeau 2714*, MO!]
Asclepias apocynifolia Woodson, in Amer. Jour. Bot. 22:687, pl. 1, fig. 1. 1935. [T.:
Bartlett 10264, MO!]

Herbaceous perennials; stems moderately stout, simple, 3-9 dm. tall, generally
 but rather inconspicuously puberulent. Leaves opposite, rather shortly petiolate,
 ovate to ovate-lanceolate, acuminate to broadly acute at the tip, broadly rounded
 to slightly cordate at the base, 6-16 cm. long, 2-9 cm. broad, membranaceous, in-
 conspicuously puberulent to glabrate above and beneath; petioles 0.7-1.0 cm. long.

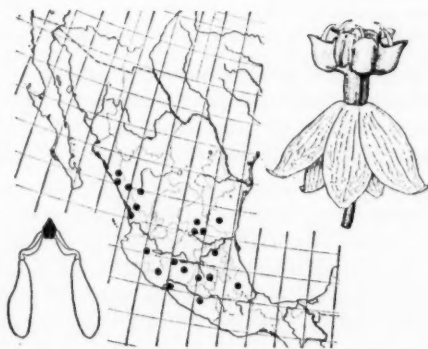


Fig. 26. *Asclepias ovata* Mart. & Gal.

Inflorescences solitary at the upper few or several nodes, several- to many-flowered; peduncles 2-7 cm. long; pedicels 1.5-2.0 cm. long. Flowers rather small; calyx lobes narrowly trigonal, 3-5 mm. long, sparsely pilosulose to glabrate; corolla reflexed-rotate, greenish white sometimes suffused with purple or rose, the lobes 6-9 mm. long; gynostegium white, narrowly stipitate, the column 1-2 mm. long, 1.5-2.0 mm. broad, the hoods rhombic with the median lobe broadly rounded and entire, 2-5 mm. long, the horn adnate to about midway of the hood, narrowly acicular, about half longer than the hood, arching gradually over the anther head, the anther head cylindrical, 2.5-3.0 mm. long and broad. Follicles erect on deflexed pedicels, rather narrowly fusiform, 7-9 cm. long, 1.0-1.6 cm. broad, smooth, glabrous; seeds oval, 5-6 mm. long, the pale tawny coma 2-3 cm. long.

Open pine and oak forests particularly on hillsides and in canyons. Central Mexico from Tamaulipas to Sinaloa and southward to Veracruz and Guerrero. Flowering from June to September.

MEXICO: DISTRITO FEDERAL: Santa Fé, Valley of Mexico, Pedregal de San Angel. DURANGO: Cacaria. GUERRERO: Chilpancingo, Montes de Oca. GUANAJUATO: Guanajuato. HIDALGO: Jacala. JALISCO: Hacienda San Marcos, Autlán. MEXICO: Temascaltepec, Lechería. MICHOACAN: Zacapu, Apatzingan. NAYARIT: Tepic, Acaponeta, Pedro Paulo. SAN LUIS POTOSÍ: Alvarez, Las Canoas, Bagre. SINALOA: San Ignacio, Las Mesas, Quebrado de Mansana. TAMAULIPAS: Jaumave. VERACRUZ: Orizaba.

Although variable, *A. ovata* is a very distinctive species particularly by reason of the leaf venation which appears as somewhat palmate because of the aggregation of the basal 3-4 secondary veins toward the base of the midrib. This is fortunate, since the holotype (in Herb. Brux.) consists only of a fragment of the upper portion of a stem bearing three somewhat damaged leaves; these, however, show the characteristic venation.

21. *ASCLEPIAS SIMILIS* Hemsl. Biol. Centr.-Amer. Bot. 2:326. 1881. [T.: *Gbiesbreght* 665, MO!]

Asclepias bidentata Hemsl. loc. cit. 322. 1881. [T.: *Coulter* 985, K!]

Asclepias alticola Fourn. in Ann. Sci. Nat. Ser. VI, 14:371. 1882. [T.: *Gbiesbreght* 34, K!]

Asclepias guatemalensis Donn. Sm. in Bot. Gaz. 18:207. 1893. [T.: *R. Gomez s. n.*, US!]

Herbaceous perennials from a rather tuberous rootstalk. Stems rather stout, simple, 2-13 dm. tall, rather inconspicuously puberulent. Leaves opposite, usually rather long-petiolate, broadly elliptic, apex rather shortly but narrowly acuminate, base obtuse to broadly acute, firmly membranaceous, dark green above, glaucous and inconspicuously pilosulose beneath; petioles 0.5-2.5 cm. long. Inflorescences solitary at the uppermost nodes, frequently terminal and paired, several- to many-flowered; peduncles 2-6 cm. long, rather stout; pedicels slender, 1.5-2.5 cm. long. Flowers moderately large; calyx lobes lance-trigonal, 4-6 mm. long, sparsely pilosulose to glabrous; corolla reflexed-rotate, greenish white or cream, the lobes 7-10 mm. long; gynostegium rather narrowly stipitate, greenish white to cream, the corona occasionally tinged with purple at the base, the column cylindrical, 1.5-2.0 mm. long, about 2 mm. broad, the hoods very broadly oval, with the median lobe

very broadly rounded and entire, the horn adnate to near the tip of the hood, acicular, arching over the anther head, the anther head brown, rather broadly cylindric, 3–4 mm. long, 3.0–3.5 mm. broad. Follicles erect on deflexed pedicels, rather narrowly fusiform, 8–15 cm. long, about 2 cm. thick, smooth, finely and densely puberulent; seeds broadly oval, 5–8 mm. long, the white coma 3.5–5.0 cm. long.

Open oak and pine woods and thickets, hillsides and along arroyos. Eastern Mexico from Tamaulipas to Chiapas; Guatemala; Honduras; Nicaragua. Flowering from June to December.



Fig. 27. *Asclepias similis* Hemsl.

MEXICO: CHIAPAS: Siltepec, El Pozo. GUERRERO: Taxco. HIDALGO: Jacala, Zacualtipán. MEXICO: Valley of Mexico. MICHOACAN: Zacapu. NUEVO LEÓN: Dulces Nombres, Villa Santiago, Monterrey, Galeana. SAN LUIS POTOSÍ: Alvarez. TAMAULIPAS: San José. TLAXCALA: San Antonio. VERACRUZ: Sta. Lucrecia.

GUATEMALA: ALTA VERAPAZ: Coban, Samac. CHIMALTENANGO: Tecpam, Alameda, Patzún, Chimaltenango. GUATEMALA: San Juan Sacatepéquez. HUEHUETENANGO: Cerro Pixpí, Chiantla, Las Palmas, San Sebastián H., Huehuetenango. JALAPA: Jalapa, Paraíso, La Laguna. QUICHÉ: Nebaj. SACATEPÉQUEZ: Pastores. SOLOLÁ: San Pedro. ZACAPA: Sierra de las Minas, Sierra de Monos.

HONDURAS: CHOLUTECA: San Marcos. COMAYAGUA: Siguatopeque. MORAZAN: El Zamorano, Mt. Uyuca, Agua Amarilla.

NICARAGUA: JINOTEGA: La Montañita, Las Mesitas, Cerro de la Cruz.

In northern Mexico, in the range of *A. ovata*, specimens of *A. similis* tend to resemble that species somewhat in having leaves that are less glaucous beneath (although no definite tendency to the subpalmate veins), flowers that are somewhat smaller, and in other less tangible respects. It seems possible that occasional hybridization might produce this effect without actually prompting the species to merge as in a genocline.

22. *Asclepias contrayerba* Sessé & Moc. Fl. Mex. ed. 1, 2:79. 1887. [T.: Sessé & Mociño 1274, F!]

Asclepias setosa Benth. Pl. Hartw. 24. 1839, non Forsk. [T.: Hartweg 213, K!]

Asclepias jaliscana Robinson, in Proc. Amer. Acad. 29:318. 1894. [T.: E. Palmer 20, MO!]

Herbaceous perennials from a thick tuberous rootstalk. Stems clustered from the rootstalk, relatively slender, simple or occasionally branching from near the base, frequently decumbent, 1.5–6.0 dm. tall, usually conspicuously setose-hispidulous, rarely glabrate. Leaves opposite, very shortly petiolate, broadly ovate to narrowly oblong-lanceolate, apex acute to obtuse, base broadly cordate to rounded, 3–12 cm. long, 1.0–4.5 cm. broad, firmly membranaceous, glaucous, frequently more or less crispate, setose-hispidulous or infrequently glabrate; petioles 2–4 mm. long. Inflorescences terminal and solitary or clustered corymbosely at the uppermost nodes, several- to many-flowered; peduncles 2–7 cm. long; pedicels 1–3 cm. long. Flowers rather small; calyx lobes ovate-lanceolate, 5–6 mm. long, minutely pilosulose; corolla pale greenish or greenish white, frequently tinged with purplish brown, the lobes 7–10 mm. long; gynostegium rather shortly stipitate, white or cream, the column rather broadly cylindrical, about 2 mm. long and broad, the hoods broadly rhombic with the median lobe gradually rounded and entire, 3–6 mm. long, the horn adnate below midway, slightly longer than the hood, arching over the anther head, the anther head broadly cylindric, 2.5–3.0 mm. long and broad. Follicles erect on deflexed pedicels, fusiform, 6–11 cm. long, 1.5–2.5 cm. broad, smooth, more or less densely setose-hispidulous; seeds oval, about 5 mm. long, the pale tawny coma about 3.5 cm. long.

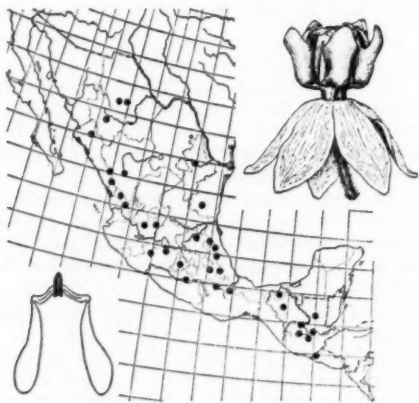


Fig. 28. *Asclepias contrayerba* Sessé & Moc.

Plains, hillsides, and barrancas, in open oak woods, thickets, and grass. Central Mexico from Tamaulipas to Sinaloa and southward to Chiapas; Guatemala; El Salvador. Flowering from May to September.

MEXICO: CHIHUAHUA: Mojarachic, Colonia García, Chihuahua. CHIAPAS: Las Casas. DURANGO: Otinapa, Cacaria. GUERRERO: Mina. HIDALGO: Jacala. JALISCO: Guadalajara, Río Blanco, León. MEXICO: Lechería, Temascaltepec. MICHOACAN: Morelia, Tancitaro. NAYARIT: Aguacate, Dolores, Acaponeta, Pedro Paulo. NUEVO LEÓN: Dulces Nombres. OAXACA: Nochixtlan, Cuicatlan, Santo Domingo. PUEBLA: San Baltazar, Esperanza. SINALOA: Cerro Colin, San Pedro, Colomos, Rosario. TABASCO: Estapilla. TAMAULIPAS: Jaumave. VERACRUZ: La Palmilla, Zacuapan, Orizaba.

GUATEMALA: GUATEMALA: Chillani, Guatemala. HUEHUETENAGO: Aguacatán. JALAPA: Montaña Durazno. PETÉN: La Libertad. SOLOLÁ: Volcán San Pedro.

EL SALVADOR: AHUACHAPAN: Cerro de San Jacinto.

It is unfortunate that Bentham's name is antedated by Forskal's; the application of Sessé's & Mocino's is directed by two specimens collected by the authors now in the herbarium of the Chicago Natural History Museum. *Contrayerba* apparently is quite an appropriate name for this very distinctive species, for the plants are still known by that name in the State of Mexico, according to Hinton, who has also found the name *lechetreño* applied to it. In Guatemala the plant is known as *sicaquina*, *jicaca*, and *jicaquina*, and it is reputed to be a sternutatory for colds. In El Salvador a name reported is *ishcaco*.

23. *ASCLEPIAS EXALTATA* L. Amoen. Acad. 3:404. 1756, ex char.

Asclepias syriaca β *exaltata* L. Sp. Pl. ed. 2, 313. 1762.

Asclepias polystachia Walt. Fl. Carol. 107. 1788, ex char. [T.: Fraser Herb., Brit. Mus.!]

Asclepias phytolaccoides Pursh, Fl. Amer. Sept. 1:180. 1816, ex char.

Asclepias bicknellii Vail, in Bull. Torrey Bot. Club 31:458, pl. 19. 1904. [T.: Bicknell s. n., NY!]

Herbaceous perennials. Stems relatively stout, simple, 4–10 dm. tall, glabrous or inconspicuously pilosulose in decurrent lines from the nodes. Leaves opposite, petiolate, ovate to elliptic or oblong-elliptic, apex shortly but narrowly acuminate, base broadly obtuse, 10–20 cm. long, 2–11 cm. broad, thinly membranaceous, scatteringly pilosulose to glabrate above, glaucous beneath; petioles 0.5–1.5 cm. long. Inflorescences subterminal and solitary at the upper nodes, several- to many-flowered; peduncle relatively stout, 0.3–8.5 cm. long; pedicels slender, 3.5–5.0 cm. long. Flowers moderately large; calyx lobes ovate-lanceolate, about 5 mm. long, essentially glabrous; corolla reflexed-rotate, white usually flushed with rose or purple without, the lobes 8–12 mm. long; gynostegium rather shortly stipitate, white, the column narrowly obconic to cylindric, about 2 mm. long and broad, the hoods tubular-cucullate, more or less conspicuously denticulate, 3.5–4.0 mm. long, the horn adnate below the middle, nearly twice as long as the hood and arching over the anther head, the anther head cylindric, 3.0–3.5 mm. long and broad. Follicles erect on deflexed pedicels, rather narrowly fusiform, 12–15 cm. long, 1.5–2.0 cm. broad, smooth, essentially glabrous; seeds broadly oval, 7–9 mm. long, the white coma 3.0–4.5 cm. long.

Moist woods, meadows, and copses. Southern Ontario; Maine to Georgia and westward to Minnesota and Iowa. Flowering from May to August.

Fig. 29. *Asclepias exaltata* L.

CANADA: ONTARIO: Elgin, Hastings, Lambton, East, Middlesex, Norfolk, and Simcoe counties.

UNITED STATES:

CONNECTICUT: Fairfield, New Haven, New London, and Tolland counties.

DELAWARE: New Castle County.

GEORGIA: Fannin, Gilmer, Rabun, and Towns counties.

ILLINOIS: Champaign, Cook, Du Page, Hardin, Henderson, Jackson, Johnson, Kankakee, Lake, La Salle, Macon, McHenry, Macoupin, Menard, Peoria, Tazewell, Union, Vermilion, Will, and Winnebago counties.

INDIANA: Allen, Bartholomew, Blackford, Cass, Crawford, Dearborn, Elkhart, Fountain, Grant, Hamilton, Hendricks, Huntington, Jackson, Kosciusko, Lagrange, Lake, La Porte, Madison, Noble, Parke, Perry, Porter, St. Joseph, Steuben, Wells, and Whitley counties.

IOWA: Allamakee, Chickasaw, Clayton, Dubuque, Fayette, Johnson, Mitchell, and Winneshek counties.

KENTUCKY: Bell, Hancock, Harlan, Martin, and Union counties.

MAINE: Androscoggin, Cumberland, Lincoln, Oxford, and York counties.

MARYLAND: Garrett and Howard counties.

MASSACHUSETTS: Barnstable, Berkshire, Bristol, Dukes, Essex, Franklin, Hampden, Hampshire, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester counties.

MICHIGAN: Cheboygan, Grand, Gratiot, Ingham, Ionia, Kalamazoo, Kent, Livingston, Macomb, Marquette, St. Clair, Van Buren, and Washtenaw counties.

MINNESOTA: Cass, Chisago, Goodhue, Hennepin, Houston, Mille Lacs, Ramsey, Rice, Scott, Steele, Wabasha, Waseca, and Winona counties.

NEW HAMPSHIRE: Belknap, Carroll, Cheshire, Grafton, Hillsborough, Merrimack, Rockingham, and Strafford counties.

NEW JERSEY: Bergen, Morris, Somerset, and Sussex counties.

NEW YORK: Albany, Cattaraugus, Cayuga, Chenango, Columbia, Delaware, Eric, Madison, Montgomery, Niagara, Oneida, Onondaga, Ontario, Oswego, Otsego, Queens, Rensselaer, Schuyler, Suffolk, Tioga, Tompkins, Ulster, Warren, and Washington counties.

NORTH CAROLINA: Ashe, Buncombe, Burke, Forsyth, Graham, Haywood, Henderson, Jackson, Macon, Mitchell, Polk, Rutherford, Swain, and Watauga counties.

OHIO: Adams, Ashtabula, Athens, Auglaize, Belmont, Carroll, Clark, Clermont, Coshocton, Columbiana, Cuyahoga, Defiance, Delaware, Erie, Franklin, Geauga, Greene, Hamilton, Highland, Hocking, Knox, Lake, Licking, Lorain, Madison, Medina, Monroe, Perry, Richland, Stark, and Williams counties.

PENNSYLVANIA: Bedford, Berks, Blair, Cambria, Carbon, Centre, Delaware, Fayette, Indiana, Luzerne, Lycoming, Monroe, Northampton, Perry, Philadelphia, Pike, Schuylkill, Snyder, and Sullivan counties.

RHODE ISLAND: Providence County.

TENNESSEE: Blount, Franklin, Grundy, and Unicoi counties.

VERMONT: Addison, Chittenden, Rutland, Windham, and Windsor counties.

VIRGINIA: Bedford, Giles, Orange, Page, and Smyth counties.

WEST VIRGINIA: Calhoun, Grant, Greenbrier, Hardy, Harrison, McDowell, Monongalia, Monroe, Morgan, Ohio, Pendleton, Preston, Raleigh, Randolph, Summers, Upshur, Wayne, and Wetzel counties.

WISCONSIN: Adams, Brown, Dane, Eau Claire, Marinette, Milwaukee, Oneida, Outagamie, Ozaukee, Portage, Racine, Rock, Vernon, Vilas, and Washburne counties.

This species, commonly known as poke milkweed, usually has been named *A. phytolaccoides* (hence the common name) or *A. exaltata* "(L.) Muhl." The bibliography here follows the discussion of Fernald and Schubert in *Rhodora* 50:218-220. 1948.

24. *ASCLEPIAS COULTERI* A. Gray, in *Proc. Amer. Acad.* 12:71. 1877. [T.: *Coulter* 983, GH!]

Asclepias tithymaloides Greene, in *Erythea* 1:151. 1893. [T.: *Pringle* 3786, MO!]

Suffrutescent perennials. Stems relatively slender, simple or branching, 3-6 dm. tall, glabrous or very inconspicuous pilosulose when very young. Leaves opposite, sessile, linear to filiform, 5-13 cm. long, 1-6 mm. broad, firmly membranaceous, glabrous. Inflorescences solitary at the uppermost nodes, few-flowered; peduncles 1-3 cm. long, slender; pedicels 2.0-2.5 cm. long. Flowers moderately large; calyx lobes lance-triangular, 2-3 mm. long; corolla reflexed-rotate, greenish white, frequently somewhat suffused with rose without at the tips, the lobes 7-9 mm. long; gynostegium rather shortly stipitate, white or cream, the column narrowly obconic, 1.25-1.5 mm. long, 1.75-2.0 mm. broad, the hoods tubular-cucullate, broadly dentate, 3.5-4.025 mm. long, the horn about half adnate to the hood and slightly longer than it, only slightly arching, the anther head narrowly conic, about 2 mm. long and 2.5 mm. broad. Follicles erect on deflexed pedicels, narrowly fusiform, 4-5 cm. long, about 7 mm. broad, smooth, glabrous and somewhat glaucous; seeds oval, about 3 mm. long, the white coma about 2 cm. long.

Dry limestone ledges. Northeastern Mexico. Flowering from May to August.

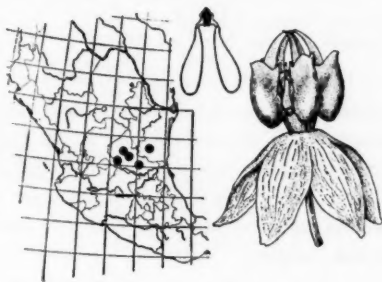


Fig. 30. *Asclepias coulteri* A. Gray

MEXICO: SAN LUIS POTOSÍ: Minas de San Rafael, Las Palmas, Sierra de Guascama, Rascón. TAMAULIPAS: Jaumave.

25. *Asclepias quinqueidentata* A. Gray, in Proc. Amer. Acad. 12:71. 1877. [T.: Wright 1689, MO!]

Asclepias quinqueidentata var. *neomexicana* Greene, ex A. Gray, loc. cit. 16:103. 1881. [T.: Greene s. n., MO!]

Asclepias schaffneri A. Gray, loc. cit. 1881. [T.: Schaffner 56, GH!]

Asclepias palmeri Vail, in Bull. Torrey Bot. Club 25:171. 1899. [T.: Parry & Palmer 583, MO!]

Asclepias amsonioides Standl. in Field Mus. Publ. Bot. 22:44. 1940. [T.: LeSueur 848, MO!]

Herbaceous perennials from rather deep, tuberous rootstalks. Stems relatively slender, simple above, branching rather caespitously below, the basal branches usually dwarf and sterile, 1.5–3.0 dm. tall, minutely and generally puberulent, rarely glabrate. Leaves opposite, sessile or subsessile, linear to filiform, 4–9 cm. long, 1–2 mm. broad, minutely and scatteringly pilosulose or puberulent. Inflorescences subterminal from few of the uppermost nodes, few-flowered; peduncles rather slender, 1–8 cm. long; pedicels slender, 1.5–2.0 cm. long. Flowers rather small; calyx lobes lance-trigonal, about 2 mm. long, minutely pilosulose to glabrate; corolla reflexed-rotate, pale green usually flushed with rose or purple without, the lobes 5–6 mm. long; gynostegium shortly stipitate, greenish white, the column narrowly obconic, about 1 mm. long and 1.5 mm. broad, the hoods cylindrical-cucullate, sharply erose, about 3 mm. long, the horns completely adnate to the hoods and about half longer than they, ascending and scarcely arching, the anther head cylindric, about 2 mm. long and broad. Follicles erect on deflexed pedicels, narrowly fusiform, 7–10 cm. long, 0.5–0.8 cm. thick, smooth, minutely puberulent; seeds oval, 5–7 mm. long, the pale tawny coma 3–4 cm. long.

Rocky hills and arroyos. Southern Arizona and New Mexico; Chihuahua to San Luis Potosí. Flowering from June to August.

UNITED STATES:

ARIZONA: Cochise, Coconino, and Pima counties.

NEW MEXICO: Grant and Socorro counties.

MEXICO: CHIHUAHUA: Sierra Madre, El Cima, Colonia Garcia, Chihuahua, Madera. SAN LUIS POTOSÍ: Morales, San Luis Potosí.

In San Luis Potosí the specimens are rather atypical, and I suspect that hybridization with *A. coulteri* may be to blame. Even if such is not the case, however, and the variation is geographic, I am quite unwilling to recognize more than one species in the complex.

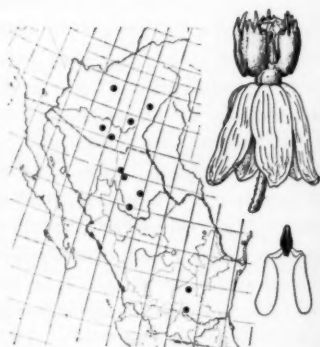


Fig. 31. *Asclepias quinqueidentata* A. Gray

26. *ASCLEPIAS AMPLEXICAULIS* Sm. in Abbott & Sm. Nat. Hist. Lepidopt. Insects Ga. 1:pl. 7. 1797, ex ic.

Asclepias obtusifolia Michx. Fl. Bor.-Amer. 1:115. 1803, ex char.

Asclepias rotundifolia Raf. Atl. Jour. 1:152. 1832, ex char.

Asclepias gladewitzii Farwell, in Amer. Midl. Nat. 12:128. 1930. [T.: Farwell 8229, NY!]

Herbaceous perennials. Stems stout, simple, 4–9 dm. tall, glabrous. Leaves opposite, sessile, broadly ovate or oval to oblong-lanceolate, apex broadly rounded to obtuse, frequently mucronate, base broadly cordate and amplexicaul, rather thickly membranaceous or subcoriaceous, more or less glaucous, frequently crispate. Inflorescences terminal and solitary, rather rarely lateral also from the uppermost node, usually many-flowered; peduncles stout, 10–30 cm. long, shorter when lateral; pedicels rather stout, 2–5 cm. long. Flowers rather large; calyx lobes lanceolate, 3–5 mm. long, glabrous; corolla reflexed-rotate, greenish more or less deeply suffused with purple or rose, the lobes 9–11 mm. long; gynostegium pale purple or rose, rather shortly stipitate, the column cylindrical, about 2 mm. long, 2.5–3.0 mm. broad, the hoods tubular-cucullate, rather indistinctly dentate to essentially entire, about 5 mm. long, the horn adnate below the middle, rather stoutly acicular, about half longer than the hood, broadly arching over the anther head, the anther head broadly cylindrical, 3.0–3.5 mm. long, about 3 mm. broad. Follicles erect on deflexed pedicels, rather narrowly fusiform, 10–16 cm. long, about 1–2 cm. thick, smooth, glabrous and rather glaucous; seeds broadly oval, 6–9 mm. long, the pale tawny coma 4–6 cm. long.

Open woods, prairies, old sand dunes, spreading to clearings, meadows, pastures, roadsides, and railways, chiefly in sandy or gravelly soil. New Hampshire to Florida, westward to Nebraska and Texas. Flowering from March to September.

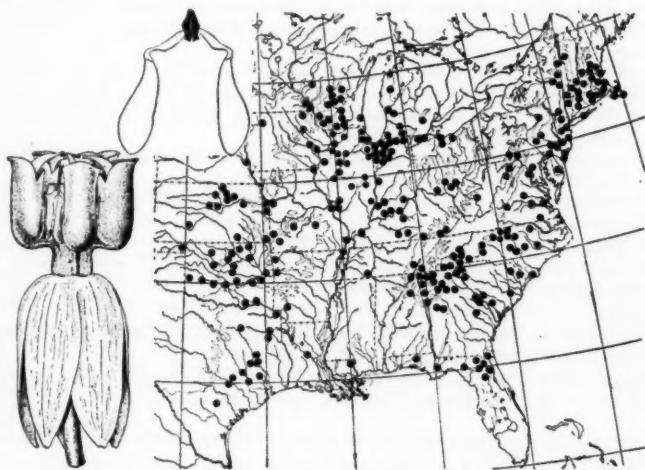


Fig. 32. *Asclepias amplexicaulis* Sm.

UNITED STATES:

ALABAMA: Etowah and Jackson counties.

ARKANSAS: Nevada, Sebastian, and Washington counties.

CONNECTICUT: Hartford, New Haven, New London, and Windham counties.

DELAWARE: New Castle and Sussex counties.

FLORIDA: Alachua, Bradford, Columbia, Duval, Lafayette, Liberty, Marion, Putnam, and Walton counties.

GEORGIA: Campbell, Clarke, Columbia, Dade, De Kalb, Emanuel, Floyd, Forsyth, Gilmer, Gwinnett, Haralson, Meriwether, Murray, Richmond, Upson, Walker, and White counties.

IOWA: Black Hawk, Johnson, Lee, Muscatine, Palo Alto, and Winneshiek counties.

ILLINOIS: Champaign, Coles, Cook, Du Page, Henderson, Iroquois, Jo Daviess, Kankakee, Lake, Lee, Madison, Mason, Marshall, Massac, Peoria, St. Clair, Sangamon, Stark, Tazewell, Wabash, and Whiteside counties.

INDIANA: Benton, Daviess, Elkhart, Fulton, Harrison, Jasper, Knox, Lagrange, Lake, Marshall, Newton, Perry, Porter, Pulaski, St. Joseph, Spencer, Starke, Steuben, Vigo, Washington, and White counties.

KANSAS: Chautauqua, Cherokee, Clay, Cloud, Edwards, Ellsworth, Miami, Pottawatomie, Riley, Saline, Wabaunsee, Washington and Wyandotte counties.

LOUISIANA: Rapides and Washington parishes.

KENTUCKY: Barren, Bell, Hardin, Harlan, Lyon, McCreary, and Warren counties.

MARYLAND: Prince Georges County.

MASSACHUSETTS: Barnstable, Berkshire, Bristol, Dukes, Essex, Franklin, Hampden, Hampshire, Middlesex, Nantucket, Norfolk, Plymouth, and Worcester counties.

MINNESOTA: Houston and Winona counties.

MICHIGAN: Cass, Kalamazoo, Kent, Lake, Livingston, Muskegon, and St. Joseph counties.

MISSOURI: Dent, Dunklin, Jackson, Jasper, Lawrence, St. Louis, and Scott counties.

NEBRASKA: Douglas County.

NEW HAMPSHIRE: Cheshire, Hillsborough, Merrimack, and Rockingham counties.

NEW JERSEY: Atlantic, Burlington, Camden, Cape May, Gloucester, Middlesex, Monmouth, Ocean, and Passaic counties.

NEW YORK: Albany, Columbia, Dutchess, Orange, Richmond, Saratoga, Schenectady, Suffolk, and Warren counties.

NORTH CAROLINA: Alexander, Brunswick, Buncombe, Catawba, Durham, Forsyth, Green, Guilford, Halifax, Haywood, Hoke, Jackson, Johnston, Macon, Madison, Moore, Orange, and Rockingham counties.

OHIO: Adams, Erie, Fulton, Gallia, Huron, Jackson, Lorain, Lucas, and Ross counties.

OKLAHOMA: Beaver, Beckham, Bryan, Caddo, Choctaw, Cleveland, Creek, Grady, Haskell, Kingfisher, McClain, Major, Muskogee, Oklahoma, Osage, Payne, Pittsburg, Pottawatomie, Tulsa, and Washington counties.

PENNSYLVANIA: Bedford, Berks, Delaware, Fulton, Lebanon, and Luzerne counties.

RHODE ISLAND: Kent and Providence counties.

SOUTH CAROLINA: Aiken, Allendale, Anderson, Berkeley, Darlington, Marion, Oconee, and Pickens counties.

TENNESSEE: Grundy, Hamilton, Knox, and McNairy counties.

TEXAS: Anderson, Austin, Bastrop, Bowie, Caldwell, Dallas, Houston, Leon, Milam, Montgomery, Smith, Wilson, and Wood counties.

VERMONT: Chittenden County.

VIRGINIA: Bedford, Fairfax, Henrico, James City, Louisa, and Southampton counties.

WEST VIRGINIA: Fayette, Hampshire, and Hardy counties.

WISCONSIN: Adams, Columbia, Crawford, Dane, Eau Claire, Grant, Green, Iowa, Juneau, Marquette, Racine, Rock, Waupaca, Waushara, and Wood counties.

Asclepias amplexicaulis is one of the most infallibly recognizable species of the genus. Nevertheless, it has occasional deviations of floral structure, although of a

sporadic nature. In Florida it seems to hybridize occasionally with *A. humistrata*, a somewhat similar appearing plant of similar environments although I have placed the latter in a different series (SYRIACAE).

27. *ASCLEPIAS VIRLETII* Fourn. in Ann. Sci. Nat. Ser. VI, 14:378. 1882, ex char. [T.: *Virlet 1685*.]

Asclepias longipedunculata Brandg. in Univ. Calif. Publ. Bot. 4:277. 1912. [T.: *Purpus 5219, MO!*]

More or less decumbent, subscapose perennials from a fleshy, napiform rootstalk. Stems slender, simple or branching sparingly from the base, erect or decumbent, 1–3 dm. tall, minutely appressed-puberulent. Leaves opposite, broadly oval to oblong-lanceolate, apex obtuse to acute, base broadly obtuse or rounded, 3–5 cm. long, 1–2 cm. broad, firmly membranaceous, minutely and generally puberulent particularly below; petioles 5 mm. long to obsolete. Inflorescences subterminal and solitary from one of the upper nodes, several-flowered; peduncles rather stout, 9–18 cm. long, minutely puberulent; pedicels slender, 1–2 cm. long. Flowers moderately large; calyx lobes lance-trigonal, about 2 mm. long, minutely puberulent-papillate; corolla reflexed-rotate, livid purple or red, the lobes 6–8 cm. long; gynostegium cream or pale purplish or rose, shortly stipitate, the column obconic, 2.0–2.5 mm. long, 2–3 mm. broad, the hoods tubular-cucullate, erose-dentate, about 3–4 mm. long, the horn almost wholly adnate, somewhat longer than the hood, entire at the tip, ascending, the anther head rather broadly cylindrical, about 2 mm. long and 2–3 mm. broad. Follicles erect on deflexed pedicels, narrowly fusiform, 8–12 cm. long, 6–8 mm. thick, smooth, densely and minutely puberulent; seeds oval, about 5 mm. long, the white coma about 3.5 cm. long.

Open woods in canyons and calcite or limestone hills. Northeastern Mexico. Blooming from May to July.

MEXICO: NUEVO LEON: Galeana, Pab-lillo, Potosí Mountain. PUEBLA: Puebla. SAN LUIS POTOSÍ: Bagre.

Rather doubtfully distinct from *A. scaposa*. Besides the larger flowers and more caulescent plants, this species (if it is such!) has peculiar dentate corona horns, and it is upon the basis of this unusual character that I am interpreting Fournier's species, the types of which apparently have been lost or misplaced in the Paris Herbarium.

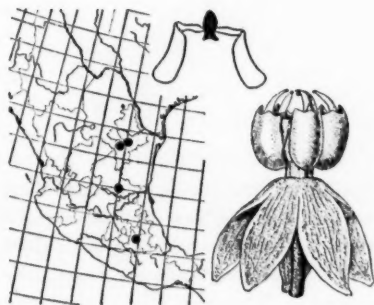


Fig. 33. *Asclepias virletii* Fourn.

28. *ASCLEPIAS SCAPOSA* Vail, in Bull. Torrey Bot. Club 25:171. 1898. [T.: Wright 7, MO!]

Asclepias exilis M. E. Jones, Contr. West. Bot. 12:48. 1908. [T.: Jones 568, MO!]
Asclepias rafaensis Brandg. in Univ. Calif. Publ. Bot. 4:277. 1912. [T.: Purpus 5214, MO!]

Small, subscapose herbaceous perennials from a fleshy napiform rootstalk. Stems simple or sparingly branched from the base, slender, 5–12 cm. tall, minutely and generally puberulent or pilosulose. Leaves opposite, petiolate, broadly oval to oblong-elliptic, apex obtuse to acute, base obtuse to rounded, 2–6 cm. long, 0.5–2.5 cm. broad, membranaceous, generally pilosulose above and below; petioles 0.5–4.0 cm. long. Inflorescences terminal, solitary, several- to many-flowered; peduncle relatively stout, 7–17 cm. long; pedicels slender, 1–2 cm. long. Flowers rather small; calyx lobes lance-trigonal, about 2 mm. long, minutely pilosulose; corolla reflexed-rotate, livid rose or purplish, the lobes 4–5 mm. long; gynostegium shortly stipitate, cream flushed with purple or rose, the column obconic, 1.0–1.5 mm. long and broad, the hoods tubular-cucullate, erose-dentate, 2–3 mm. long, the horn acicular and ascending, somewhat longer than the hood and strongly adnate to it, entire, the anther head about 1.5 mm. long and 2 mm. broad. Follicles erect on deflexed pedicels, narrowly fusiform, about 5 cm. long and 5–7 mm. thick, smooth, minutely pilosulose; seeds unknown.

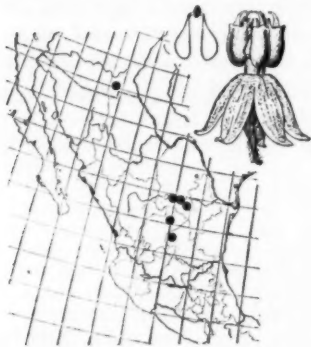


Fig. 34. *Asclepias scaposa* Vail

specimen of the species, was found duplicated in both the Gray Herbarium and the herbarium of the New York Botanical Garden without a number; in the herbarium of the Missouri Botanical Garden a third duplicate bears the number 7, which probably is an arbitrary number assigned by Engelmann and not a field number in the true sense. Without a field number, the actual place of collection of Wright's specimen cannot be ascertained; it appears more than possible that it may have been actually in Coahuila, considerably south of the present boundary of New Mexico.

Dry, sunny, gravelly openings among scrub oaks, mountain sides and flats. Southern New Mexico; north-central Mexico. Flowering from March to October.

UNITED STATES:

NEW MEXICO: Grant County (?).

MEXICO: COAHUILA: Saltillo, La Noria, Sierra de Parras. SAN LUIS POTOSÍ: Minas de San Rafael. ZACATECAS: Pastorilla.

Asclepias scaposa has been rather an enigma since its description from a single depauperate fruiting specimen by Miss Vail in 1898. This, which remains the only specimen recorded from the United States as well as the only fruiting

Asclepias scaposa is very closely related to *A. virletii*, differing chiefly in the truly terminal inflorescences and the smaller flowers (together with such technical characters of the hoods as the entire, acicular horns). I do not believe these features to be environmental, however, since they are fairly constant; Runyon (sub 1326 in U. S. Nat. Herb.) collected unusually lush specimens in "black fertile soil" near Saltillo, but they still produced the solitary terminal inflorescences and small flowers.

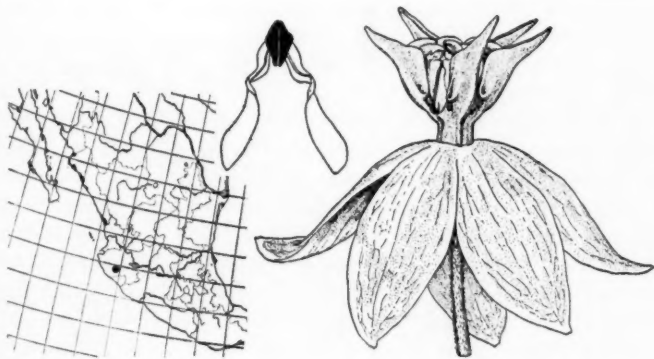
Series 4. GRANDIFLORAE

KEY TO THE SPECIES

- a. Leaves shortly but definitely petiolate, acute to obtuse at the base; peduncles much shorter than the subtending leaves; flowers relatively large, the corolla lobes spreading or somewhat ascending, about 1.5 cm. long; column cylindric, about as long as broad; hoods rather narrow, acuminate. Southwestern Jalisco 29. *A. crocea*
22. Leaves sessile, deeply cordate and amplexicaul; peduncles usually about as long as the subtending leaves or somewhat longer; column rather broadly obconic to essentially obsolete; hoods about as broad as long.
- b. Flowers relatively large, the corolla lobes spreading or somewhat ascending, 1.5–2.0 cm. long; hoods 6–11 mm. long, broadly acute. Mexico southward to Oaxaca..... 30. *A. grandiflora*
- bb. Flowers relatively small, the corolla lobes reflexed, 8–12 mm. long; hoods 5–7 mm. long, broadly rounded or emarginate. Jalisco to Veracruz and southward to Chiapas; Guatemala; El Salvador; Costa Rica 31. *A. glaucescens*

29. *ASCLEPIAS crocea* Woodson, spec. nov.

Herbae perennes e caudice elongato subtuberoso. Caules graciliusculi simplices glabri vel juventate inconspicue pilosuli ca 7 dm. alti. Folia opposita petiolata lamina elliptica apice acuminata basi acuta vel obtusa 7–10 cm. longa 1.5–3.5 cm. lata tenuiter membranacea glabra vel subtus tenuissime pilosula et glauca. Inflorescentiae paucae e nodis subterminalibus pauciflores; pedunculis 1–2 cm. longis graciliusculis; pedicellis gracilibus 1.5–2.0 cm. longis pedunculo similibus inconspicue pilosulis. Flores magni speciosissimi; calyci laciniis anguste lanceolatis ca.

Fig. 35. *Asclepias crocea* Woods.

6 mm. longis sparse pilosulis; corolla rotata pallide crocea extus plus minus fulvo-tincta, lobis late ellipticis ca. 1.5 cm. longis patulis; gynostegio valde stipitato fulvo, columna late cylindrica ca. 1.5 mm. longa 2.0 mm. lata, cucullis valde conduplicatis rhomboideis acuminatis marginibus acutis breviter stipitatis ca. 7 mm. longis cornu valde adnato incurvato cucullo paullo breviori, androecio late subcylindrico ca. 4 mm. longo et lato. Folliculi ignoti.—HOLOTYPE: R. L. & C. R. Wilbur 1990 in Herb. Missouri Bot. Gard. ("Open pine-covered ridges and slopes in mountains e. of Mamantlán about 15 miles south-southeast of Autlán by way of Chante, Jalisco, Mexico, 8700 ft., July 30, 1949.")

Only four plants were found by the collectors at the type locality, but a short distance ("over two hours by hard hiking") away an additional plant was found in bud (Wilbur & Wilbur 1903 in Herb. Univ. Michigan). Still a third collection has more recently been found in the same vicinity, McVaugh 13858, in Herb. Univ. Michigan.

Asclepias crocea was mistaken for *A. grandiflora* at first glance, but is abundantly distinct, as the Key to Species shows.

30. *ASCLEPIAS GRANDIFLORA* Fourn. in Ann. Sci. Nat. Ser. VI, 14:379. 1882. [T.: *Habn s. n.*, P!]

Asclepiodora insignis Brandg. in Zoe 5:253. 1908. [T.: *Purpus 2624*, MO!]

Asclepias insignis (Brandg.) Woodson, in Ann. Missouri Bot. Gard. 28:207. 1941.

Herbaceous, glabrous, and extremely glaucous perennials from deep subtuberous rootstalks. Stems stout, simple, 1.5–7.0 dm. tall. Leaves opposite, sessile, very broadly ovate to ovate-oblong, apex very broadly obtuse to rounded and usually mucronulate, base broadly cordate and amplexicaul, 5–12 cm. long, 1.5–6.0 cm. broad, usually rather strongly crispate and apparently somewhat succulent. Inflorescences solitary and lateral at the upper several nodes, sometimes subterminal,

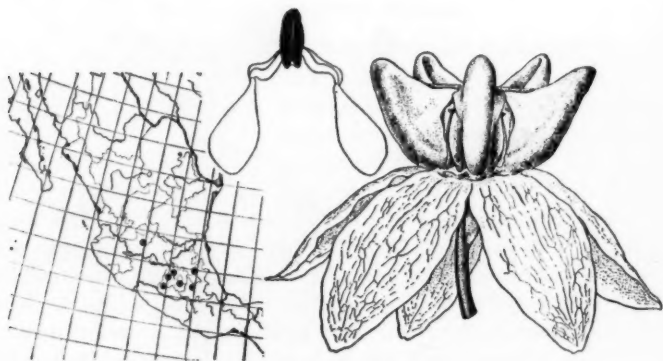


Fig. 36. *Asclepias grandiflora* Fourn.

rather few-flowered; peduncles rather stout, 4–8 cm. long; pedicels rather slender, 1–3 cm. long. Flowers very large and showy; calyx lobes ovate, 6–8 mm. long, glaucous and suffused with purple; corolla rotate, pale green, usually rather strongly suffused with purple without, the lobes 1.5–2.0 cm. long, spreading or somewhat ascending; gynostegium rather broadly stipitate, apparently greenish cream with the keel somewhat suffused with purple or brown, the column obconic, 4–5 mm. long and broad, the hoods strongly conduplicate, broadly hastate-rhombic, obtuse at the apex, the marginal lobes acute and recurved, shortly stipitate, 6–11 mm. long, the horn short and incurved or reduced to a rather low crest, the anther head 4–5 mm. long and broad. Follicles erect on deflexed pedicels, narrowly fusiform, 8–12 cm. long, about 1.0–1.5 cm. thick, smooth, very minutely and scatteringly puberulent to glabrate; seeds broadly oval, about 6 mm. long, the pale yellowish or white coma about 3.5 cm. long.

Hillside, frequently in open oak woods. Southeast-central Mexico. Blooming from July to October.

MEXICO: GUERRERO: Taxco, Limón Mt. JALISCO: Huejuquilla. MEXICO: Temascaltepec. MORELOS: Cuantla, Xochiltepec. PUEBLA: Tlacuiloltepec, San Luis Tultitlanapa.

This is one of the showiest American asclepiads, rivalling the best of the South African species. A popular name reported by Hinton is *lechbetresna*, which is also applied to *A. contrayerba* and other species.

31. *ASCLEPIAS GLAUDESCENS* HBK. Nov. Gen. 3:190. *t.* 227. 1819. [T.: *Bonpland* 3920, MO, photo!]

Asclepias glaberrima Sessé & Moc. La Naturaleza ser. 2, 1:app. 43. 1888. [T.: Sessé & Moc. 1278, FI!]

Asclepias polyphylla Brandg. in Univ. Calif. Publ. Bot. 6:371. 1917. [T.: *Purpus s. n.*, MO!]

Herbaceous, glabrous, and glaucous perennials from rather deep fleshy root-stalks. Stems rather stout, simple, 1.5–8.0 dm. tall. Leaves opposite, sessile, broadly ovate or oval to narrowly ovate-oblong, apex broadly acute to rounded, frequently mucronulate, base broadly cordate and amplexicaul, frequently rather crispate and apparently somewhat succulent, 6–18 cm. long, 1–7 cm. broad. Inflorescences solitary and lateral at few or several of the upper nodes, occasionally solitary and terminal, several- to many-flowered; peduncles rather stout, 2–20 cm. long; pedicels rather stout, 1.0–3.5 cm. long. Flowers rather large; calyx lobes ovate-lanceolate, 4–5 mm. long; corolla reflexed-rotate, greenish cream frequently suffused with rose or purple without, the lobes 8–12 mm. long; gynostegium shortly stipitate to subsessile, cream or pinkish, the column broadly cylindrical, about 1 mm. long and 2 mm. broad, the hoods strongly conduplicate, obovate, rounded and frequently emarginate, the marginal lobes broadly obtuse or rounded, 5–7 mm. long, the horn almost wholly adnate, rather short and incurved, the anther head shortly cylindrical, about 3 mm. long and 3–4 mm. broad. Follicles erect on deflexed pedicels, narrowly fusiform, 8–10 cm. long and about 1 cm. thick, smooth,

Fig. 37. *Asclepias glaucescens* HBK.

glabrous; seeds broadly oval, 6–8 mm. long, the white coma 2.5–3.5 cm. long.

Open oak-pine woods, grassy hills and llanos, spreading to dry fields and roadsides. Central Mexico to Guatemala, El Salvador, and Costa Rica.

MEXICO: CHIAPAS: Cerro de Tonalá. COAHUILA: Múzquiz, Parras. GUERRERO: Chilpancingo, Coyuca, Taxco. JALISCO: San Marcos. MEXICO: Temascaltepec. MICHOACAN: Apatzingán, Volcán Jorullo, Los Reyes, Hacienda Coahuayutla, Zinapecuaro, Coalcomán. MORELOS: Yautepec, Cuernavaca, Valle del Tepeite, Tepoztlán. NAYARIT: Tepic. OAXACA: Tehuantepec, San Pedro Yulox, San Luis, Yalalag, Cerro de San Felipe. PUEBLA: Atlixco, Cerro de Gavilán. SAN LUIS POTOSÍ: San Luis Potosí, Las Canoas. VERACRUZ: San Martín Tlactotec, Maltrata.

GUATEMALA: ALTA VERAPAZ: Sacanquim, Sepacuite, Lanquin. CHIMALTENANGO: Chimaltenango, San Martín Jilotepeque. CHIMULULA: Río Tacó. GUATEMALA: Guatemala. HUEHUETENANGO: Río Pucal, San Rafael Pétzal, Los Pinitos, Huehuetenango, San Sebastián H., Democracia. JALAPA: Río Jalapa. PETÉN: La Libertad. SOLOLÁ: San Pedro.

EL SALVADOR: SAN SALVADOR: Cerro de San Jacinto, San Salvador, San Martín, Laguna de Iloponga. SAN VICENTE: San Vicente.

COSTA RICA: ALAJUELA: Circeles. CARTAGO: Las Cóncavas, La Carpintera. SAN JOSÉ: Tres Ríos.

Popular names reported for *A. glaucescens* are *lechitresma* (Mexico), *oreja de liebre* (Veracruz), *capuyo leche*, *polín*, and *jicaca* (Guatemala and El Salvador), and *mata coyote* (El Salvador). The plant is reputed to be poisonous, but is used in the treatment of colic and to bring boils to a head.

A discussion of the relationship of *A. glaucescens* and *A. elata* will be found under the latter species.

Series 5. SYRIACAE

KEY TO THE SPECIES

- a. Plants herbaceous; leaves opposite.
 - b. Hoods sessile or subsessile and more or less pouched at the base.
 - c. Hoods broadly rounded to broadly acute at the tip; horn typically present.
 - d. Hoods delicately petalaceous; glands of translators relatively minute; follicles erect on erect pedicels.
 - e. Leaves ovate-elliptic, two or rarely three nodes typically condensed to form a false whorl; corolla pale pink. Southeastern Ontario; Massachusetts to Virginia and westward to Kansas and Oklahoma32. *A. quadrifolia*
 - ee. Leaves linear to filiform, opposite; corolla greenish white more or less suffused with purple. Northern Florida33. *A. viridula*
 - dd. Hoods fleshy and more or less inflated; glands of translators relatively massive.
 - e. Plants generally puberulent or tomentulose; leaves definitely petiolate.
 - f. Hoods about as long as the anther head; corolla dull rose, occasionally white; follicles pendulous or subpendulous, the seeds naked. Southern San Luis Potosí to northern Guatemala34. *A. pellucida*
 - ff. Hoods twice as long as the anther head or nearly so; follicles erect on deflexed pedicels.
 - g. Plants relatively slender; leaves 3-7 cm. long; flowers relatively few and lax; corolla greenish white tinged with purple, the lobes about as long as the hoods; follicles smooth. Wisconsin and northern Illinois to the Dakotas; southern Manitoba to Saskatchewan35. *A. ovalifolia*
 - gg. Plants relatively stout; leaves 6-30 cm. long or more; flowers very many and crowded; corolla dull purplish rose (rarely white), the lobes longer than the hoods; follicles softly spinose (rarely smooth). New Brunswick to Virginia and westward to North Dakota and Kansas; locally introduced elsewhere in the United States36. *A. syriaca*
 - f. Plants prostrate or decumbent; leaves deeply cordate, sessile and amplexicaul; flowers rather small and numerous; corolla pale pink. Coastal Plain: North Carolina to Louisiana37. *A. humistrata*
 - ff. Plants erect; leaves obtuse or broadly rounded at the base; flowers moderately large and few; corolla greenish cream tinged with purple. Southern Wisconsin and northern Illinois westward to Iowa and eastern Kansas38. *A. meadii*
 - cc. Hoods narrowly but obtusely acuminate, deep purple; horn typically absent; corolla pale green suffused with purple. Southern New Mexico and Arizona; northern Chihuahua and Sonora39. *A. hypoleuca*
 - bb. Hoods distinctly stipitate, flattened dorsally, not pouched at the base; corolla greenish white tinged with purple without.
 - c. Plants softly puberulent generally; stems relatively stout; leaves broadly ovate, moderately large; flowers small and very crowded; body of the hood scarcely longer than the stipe; horn frequently absent; follicles pendulous, the seeds naked. Jalisco and southern San Luis Potosí southward to Morelos and Puebla40. *A. pringlei*
 - cc. Plants essentially glabrous; stems rather slender; leaves lanceolate to ovate-lanceolate, rather small; flowers rather few and lax; body of the hood much longer than the stipe; horn typically present; follicles erect on deflexed pedicels, the seeds comose. Sinaloa to Michoacan41. *A. pratensis*
 - aa. Plants fruticose to suffruticose; leaves spirally approximate, filiform, pine-like; flowers rather small and crowded, greenish white. Southern Arizona and adjacent California; southward virtually throughout highland Mexico to Oaxaca42. *A. linearis*

Asclepias quadrifolia and *A. viridula* are placed in series SYRIACAE with considerable misgivings: because of the follicles erect on erect pedicels I would much rather place them with the INCARNATAE, as well as because of the petalaceous coronas. However, in other respects the floral structure is similar to the more typical species of the series, and these species might be considered as indicating the origin of the SYRIACAE from the INCARNATAE.

Asclepias hypoleuca, similarly, seems to show a transition to the MACROTIDES because of the apparently somewhat keeled hoods; and *A. humilis*, *A. pratensis*, and *A. linaria* transitions to the PURPURASCENTES because the hoods are flattened dorsally. All are maintained in SYRIACAE because of the pronounced marginal lobes of the hoods.

32. *ASCLEPIAS QUADRIFOLIA* Jacq. Obs. Bot. 2:8. 1767, ex char.

Asclepias vanillea Raf. in Amer. Monthly Mag. 4:39. 1818, ex char.

Asclepias quadrifolia var. *oppositifolia* Raf. Aut. Bot. 177. 1840, ex char.

Herbaceous perennials from rather long and fleshy rootstalks. Stems slender, 2–5 dm. tall, usually simple, more or less puberulent in decurrent lines from the nodes. Leaves basically opposite but two (or rarely three) nodes usually condensed to form a false whorl, petiolate or the lowermost sessile or subsessile, ovate to ovate-elliptic, acuminate, the base obtuse or rounded and usually somewhat decurrent, 2.5–12.0 cm. long, 1–6 cm. broad, thinly membranaceous, glabrous or very indistinctly pilosulose beneath; petioles 0.5–2.5 cm. long or nearly obsolete. Inflorescences terminal and solitary, occasionally lateral also at the uppermost node, several- to many-flowered; peduncles 1.5–3.5 cm. long, slender, inconspicuously pilosulose; pedicels 1.5–3.0 cm. long, pilosulose. Flowers rather small; calyx lobes lanceolate, about 1.5 mm. long; corolla reflexed-rotate, pale pink or cream, the lobes about 5 mm. long; gynostegium shortly stipitate, white, the column broadly obconic, about 1 mm. long and 1.0–1.5 mm. broad, the hoods cucullate, 4–5 mm. long, somewhat spreading, obtuse or rounded at the tip, with very pronounced marginal lobules and more or less conspicuous, excurrent lateral appendages at the base, the horn basally adnate, rather broadly acicular, somewhat longer than the

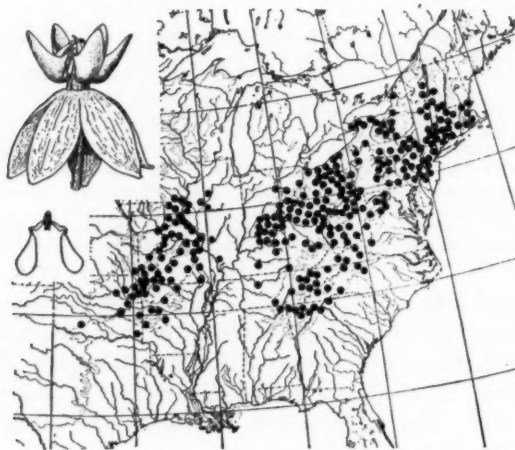


Fig. 38. *Asclepias quadrifolia* Jacq.

hood, incurved toward the anther head, the anther head broadly truncate-conic, about 2 mm. long and 2.5 mm. broad. Follicles erect on erect pedicels, narrowly fusiform, 8–12 cm. long, about 4–8 mm. thick, smooth, glabrous; seeds oval, about 7 mm. long, the white or pale tawny coma about 3.5 cm. long.

Woods and thickets, usually rather dry and rocky. Southwestern Vermont to northeastern Alabama and westward to southeastern Indiana; Iowa, Arkansas, and adjacent Illinois, Oklahoma, and Kansas; Canada (southeastern Ontario). Flowering from April until July.

CANADA: ONTARIO: Welland County.

UNITED STATES:

ALABAMA: Jackson County.

ARKANSAS: Benton, Carroll, Conway, Garland, Izard, Logan, Polk, Washington, and Yell counties.

CONNECTICUT: Fairfield, Hartford, Litchfield, Middlesex, New Haven, and Windham counties.

GEORGIA: Dade, Dawson, Gilmer, Lumpkin, Pickens, Walker, and White counties.

IOWA: Lee and Van Buren counties.

ILLINOIS: Adams, Fulton, Greene, Hancock, Peoria, Tazewell, and Union counties.

INDIANA: Bartholomew, Brown, Clark, Crawford, Dearborn, Decatur, Franklin, Harrison, Jackson, Jefferson, Jennings, Lawrence, Monroe, Orange, Ripley, Scott, Switzerland, Washington, and Wells counties.

KANSAS: Cherokee County.

KENTUCKY: Boyd, Breathitt, Fayette, Jefferson, Jessamine, McCreary, Magoffin, Nelson, Warren, Wolfe, and Woodford counties.

MASSACHUSETTS: Berkshire, Bristol, Essex, Franklin, Hampden, Middlesex, Norfolk, Suffolk, and Worcester counties.

MISSOURI: Barry, Benton, Boone, Callaway, Chariton, Christian, Cooper, Franklin, Gasconade, Greene, Iron, Jasper, Jefferson, Knox, Laclede, Lawrence, Lincoln, McDonald, Macon, Maries, Marion, Monroe, Newton, Ozark, Pettis, Pike, Polk, Ralls, Ripley, St. Francois, St. Louis, Saline, Schuyler, Scotland, Shannon, Stone, Taney, Texas, and Wayne counties.

NEW JERSEY: Bergen, Burlington, Gloucester, Hunterdon, Mercer, and Somerset counties.

NEW YORK: Albany, Allegheny, Cayuga, Columbia, Dutchess, Essex, Genesee, Greene, Jefferson, Monroe, Niagara, Onondaga, Ontario, Orange, Rensselaer, Rockland, Saratoga, Schoharie, Schuyler, Seneca, Tioga, Tompkins, Ulster, Warren, Washington, Westchester, and Yates counties.

NORTH CAROLINA: Ashe, Buncombe, Guilford, Haywood, Polk, and Stokes counties.

OHIO: Adams, Ashtabula, Auglaize, Belmont, Carroll, Clark, Clermont, Clinton, Columbiana, Cuyahoga, Delaware, Erie, Fairfield, Gallia, Greene, Hamilton, Highland, Hocking, Jackson, Knox, Lake, Lawrence, Lorain, Madison, Medina, Meigs, Miami, Monroe, Montgomery, Perry, Pickaway, Pike, Portage, Richland, Ross, Scioto, Stark, Summit, Tuscarawa, Warren, Wayne, and Wyandot counties.

OKLAHOMA: Adair, Cherokee, Comanche, Delaware, Le Flore, McCurtain, Mayes, Muskogee, and Tulsa counties.

PENNSYLVANIA: Bedford, Berks, Bradford, Bucks, Centre, Chester, Clarion, Clinton, Delaware, Fayette, Franklin, Fulton, Greene, Huntingdon, Juniata, Lackawanna, Lancaster, Lebanon, Lehigh, Luzerne, Lycoming, Mifflin, Monroe, Montgomery, Northampton, Pike, Schuylkill, Snyder, Warren, Washington, Wayne, Wyoming, and York counties.

RHODE ISLAND: Providence County.

SOUTH CAROLINA: Pickens County.

TENNESSEE: Anderson, Blount, Davidson, Franklin, Grainger, Knox, Loudon, Rhea, Sevier, Sullivan, and Union counties.

VERMONT: Bennington, Rutland, and Windham counties.

VIRGINIA: Bath, Bedford, Clarke, Giles, Grayson, Montgomery, Smyth, Shenandoah, and Warren counties.

WEST VIRGINIA: Berkeley, Braxton, Cabell, Calhoun, Greenbier, Hampshire, Kanawha, Lincoln, Marion, Mingo, Monongalia, Nichols, Pendelton, Polk, Raleigh, Randolph, Summers, Upshur, Wayne, Wetzel, and Wirt counties.

This charming little species is remarkably constant in spite of the sporadic failure of its nodes to form the characteristic false whorl. It is rather odd that its two disjunct populations have not evolved morphological differentiation of some sort.

33. *ASCLEPIAS VIRIDULA* Chapm. Fl. Southern U. S. 363. 1860. [T.: *Chapman s.n.*, MO!]

Herbaceous perennials from rather long fleshy rootstalks. Stems solitary or occasionally in small clusters, slender, simple, glabrous or minutely pilosulose in lines decurrent from the nodes, 3–4 dm. tall. Leaves opposite, sessile, linear to filiform, 2–7 cm. long, 1–2 mm. broad, membranaceous, glabrous. Inflorescences terminal and lateral at a few of the uppermost nodes, several-flowered; peduncles 0.5–3.0 cm. long, slender; pedicels very slender, about 1 cm. long. Flowers rather small; calyx lobes ovate, 2.0–2.5 mm. long; corolla reflexed-rotate, pale purplish green, the lobes about 5 mm. long; gynostegium shortly stipitate, white, the column obconic, about 1 mm. long and broad, the hoods cucullate, about 3 mm. long, somewhat spreading, rounded at the tip and with conspicuous marginal lobes, the horn falciform, adnate at the base, about as long as the hood, the anther head 1.0 mm. long and about 1.5 mm. broad. Follicles erect on erect pedicels, narrowly fusiform, 8–10 cm. long, about 6 mm. thick, smooth, glabrous; seeds broadly oval, about 8 mm. long, the white coma 2.5–3.0 cm. long.

Open flatwoods. Northern Florida. Blooming from April to July.

UNITED STATES:

FLORIDA: Baker, Bradford, Duval, Flagler, Franklin, and Nassau counties.

Perhaps closely related to *A. michauxii* which it resembles in many respects; although the two ranges coincide in Florida, I have observed no intergradation between them.

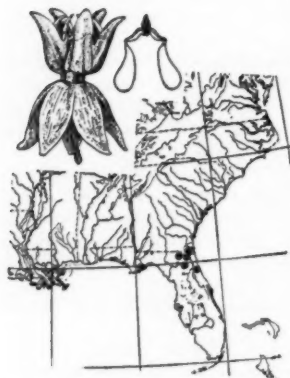


Fig. 39. *Asclepias viridula* Chapm.

34. *ASCLEPIAS PELLUCIDA* Fourn. in Ann. Sci. Nat. Ser. VI, 14:381. 1882. [T.: *Botteri* 317, P!]

Herbaceous perennials. Stems relatively stout, simple, occasionally with weak sterile axillary branches toward the base, 1–4 m. tall, glabrous or inconspicuously pilosulose at the nodes. Leaves opposite, petiolate, broadly ovate- to oblong-elliptic, apex narrowly acuminate, base obtuse to rounded, 7–30 cm. long, 2.5–9.0 cm. broad, thinly membranaceous, glabrous above, weakly pilosulose on the midrib and veins beneath; petioles 2–3 cm. long. Inflorescences lateral and solitary at few or several of the uppermost nodes, several- to many-flowered; peduncles 4–10 cm. long, relatively stout, scatteringly pilosulose; pedicels rather slender, 2–4 cm. long. Flowers rather small; calyx lobes oblong-lanceolate, 3–4 mm. long; corolla dull rose, occasionally white, the lobes 6–8 mm. long; gynostegium shortly stipitate, pale rose to white, the column obconic, about 1 mm. long and 1.5 mm. broad, the hoods cucullate, obovate, 2.5–3.5 mm. long, the horn shortly falciform, about half adnate, somewhat longer than the hood, the anther head truncately conic, 2–3 mm. long, about 3–4 mm. broad. Follicles pendulous on pendulous peduncles, rather broadly ovoid, abruptly apiculate, 7–8 cm. long, 2–4 cm. thick, smooth, glabrous; seeds broadly oval, about 1.5 cm. long, naked.

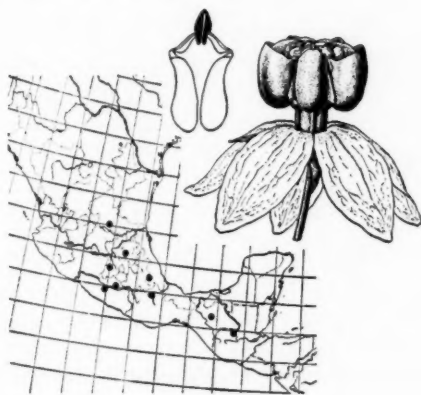


Fig. 40. *Asclepias pellucida* Fourn.

Pine-oak forests, barrancas. Southern Mexico; Guatemala. Blooming sporadically throughout the year.

MEXICO: CHIAPAS: locality indefinite. GUERRERO: Mina, Sierra Madre. HIDALGO: Trinidad Iron Works. JALISCO: Sierra de Manantlán. MEXICO: Temascaltepec. OAXACA: Dto. Cuicatlan. SAN LUIS POTOSÍ: Alvarez. VERACRUZ: Orizaba.

GUATEMALA: HUEHUETENANGO: Santa Eulalia.

The naked seeds of *A. pellucida* suggest an adaptation for dissemination by water, but the meagre field notes of collectors do not confirm this.

35. *ASCLEPIAS OVALIFOLIA* Dcne. in DC. Prodr. 8:567. 1844. [Based on *A. variegata* β *minor* Hook.]

Asclepias variegata β *minor* Hook. Fl. Bor.-Amer. 2:52, t. 141. 1838, ex ic. [T.: Richardson s. n.]

Herbaceous perennials. Stems relatively slender, simple or sometimes branched below ground, 1-3 dm. tall, densely and minutely puberulent. Leaves opposite, shortly petiolate, broadly ovate or oval to rather narrowly elliptic, apex broadly acute to obtuse, base obtuse to rounded, 3-7 cm. long, 1.5-4.0 cm. broad, membranaceous, softly and generally puberulent particularly below; petioles 2-7 mm. long. Inflorescences terminal and solitary occasionally also from the uppermost node, several-flowered; peduncles rather slender, 1-7 cm. long; pedicels slender, 1.5-2.0 cm. long. Flowers rather small; calyx lobes ovate-lanceolate, 3-4 mm. long, densely puberulent; corolla reflexed-rotate, greenish white and somewhat tinged with purple without, the lobes 5-7 mm. long; gynostegium shortly stipitate,

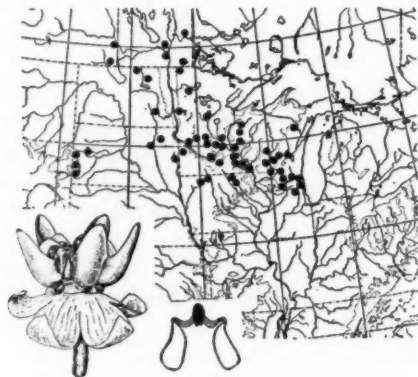


Fig. 41. *Asclepias ovalifolia* Dcne.

greenish white or cream, the column broadly obconic, about 1 mm. long and 2.5 mm. broad, the hoods cucullate, ovate-rhombic, spreading, about 5 mm. long, the horn adnate toward the base, falciform, incurved, about as long as the hood or somewhat shorter, the anther head truncately conic, about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, narrowly fusiform, 6-8 cm. long, about 1 cm. thick, smooth, densely puberulent; seeds oval, about 4 mm. long, the pale yellowish coma about 2.5 cm. long.

Sandy prairies and open woods, gravelly knolls, spreading to railways. Wisconsin and northern Illinois westward to the Dakotas; southern Manitoba and Saskatchewan. Flowering from May to July.

CANADA: MANITOBA: Birtle, Emerson, Iberville, Killarney, Morris, Norfolk, and St. Clement's counties. SASKATCHEWAN: Canora County.

UNITED STATES:

ILLINOIS: McHenry County.

IOWA: Chickasaw, Clay, Emmet, and Mitchell counties.

MINNESOTA: Anoka, Chippewa, Clay, Clearwater, Crow Wing, Hennepin, Houston, Kandiyohi, McLeod, Meeker, Nicollet, Olmstead, Ramsey, Roseau, Wabasha, Waseca, Winona, and Yellow Medicine counties.

NORTH DAKOTA: Barnes, Benson, and Rolette counties.

SOUTH DAKOTA: Brookings, Custer, Day, Lawrence, Meade, Pennington, and Spink counties.

WISCONSIN: Adams, Barron, Columbia, Dane, Dunn, Jefferson, Juneau, Marinette, Milwaukee, Pierce, Racine, Rock, Sauk, Washburn, Waushara, Winnebago, and Wood counties.

The most characteristic asclepiad of the northern prairies, a charming little species somewhat reminiscent of *A. quadrifolia* in general aspect.

36. *ASCLEPIAS SYRIACA* L. Sp. Pl. 214. 1753. [T.: Linn. Herb. London, no. 310.14, photo!]

Asclepias apocinum Gat. Descr. Pl. Montaub. 58. 1789, ex char.*Asclepias pubescens* Moench, Meth. 716. 1794, non L., ex char.*Asclepias capitellata* Raf. Med. Rep. N. Y. 5:354. 1808, ex char.*Asclepias fragrans* Raf. loc. cit. 1808, ex char.*Asclepias pubigera* Dum. Fl. Belg. 52. 1827, ex char.*Asclepias elliptica* Raf. Aut. Bot. 179. 1840, ex char.*Asclepias serica* Raf. loc. cit. 1840, ex char.*Asclepias cornuti* DCne. in DC. Prodr. 8:564. 1844. [Based on *A. syriaca* L.]*Asclepias grandifolia* Bert. in Mem. Accad. Sci. Bologna 3:189. 1851, ex char.*Asclepias kansana* Vail, in Bull. Torrey Bot. Club 31:457, pl. 16, fig. 44; pl. 18. 1904. [T.: Norton 763, NY!]*Asclepias intermedia* Vail, loc. cit. 459, pl. 16, fig. 2; pl. 17, figs. 2 a-f. 1904. [T. Bicknell s. n., NY!]*Asclepias syriaca* f. *inermis* Churchill, in Rhodora 20:207. 1919. [T.: Churchill s. n., MO!]*Asclepias syriaca* var. *kansana* (Vail) Palmer & Steyererm. in Ann. Missouri Bot. Gard. 22:621. 1935.*Asclepias syriaca* f. *leucantha* Dore, in Rhodora 46:387. 1944, ex char. [T.: Dore s. n.]

Herbaceous perennials from rather deep gemmiferous roots. Stems stout, usually simple, 1-2 m. tall, finely tomentulose above, becoming glabrate. Leaves opposite, petiolate, broadly ovate or oval to rather narrowly oblong-elliptic, apex acute to rounded, base obtuse to rounded, 6-30 cm. long, 3-10 cm. broad, firmly membranaceous, persistently tomentulose beneath, glabrate above; petioles about 1 cm. long. Inflorescences solitary and lateral at few or several upper nodes, usually many-flowered; peduncles stout, 2-12 cm. long, finely tomentulose; pedicels relatively slender, 2-5 cm. long, finely tomentulose. Flowers moderately large; calyx lobes ovate-lanceolate, 3-4 mm. long, minutely puberulent or tomentulose; corolla reflexed-rotate, usually rose or purplish, rarely white, the lobes 7-9 mm. long; gynostegium shortly stipitate, pale rose, rarely white, the column broadly obconic, 1.0-1.5 mm. long, 2-3 mm. broad, the hoods cucullate, ovate, spreading, 4-5 mm. long, the horn basally adnate, falciform and incurved, somewhat shorter than the hood, the anther head truncately conic, about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, broadly or narrowly fusiform, usually

rather shortly apiculate, very variable, 7–12 cm. long, 2–4 cm. thick, smooth or softly spinose, more or less densely tomentulose; seeds oval, 6–8 mm. long, the white coma 3–4 cm. long.

Prairies and alluvial bottoms, spreading to meadows, fields, roadsides, and railways. Maine to Virginia and westward to North Dakota and Kansas, introduced locally in Georgia, Oklahoma, and Oregon; southern Canada from New Brunswick to Manitoba. Blooming from June to August.

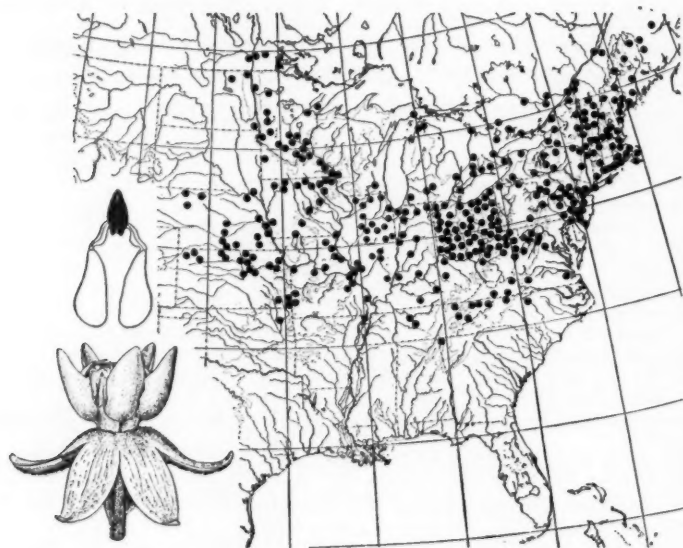


Fig. 42. *Asclepias syriaca* L.

CANADA: MANITOBA: Elmwood, St. Boniface, and Winnipeg counties. NEW BRUNSWICK: Carleton and Victoria counties. ONTARIO: Bruce, Carleton, Elgin, Hastings, Huron, Lambton, Lanark, Middlesex, Muskoka, Oxford, Renfrew, Simcoe, and Welland counties. QUEBEC: Beauharnois, Bonaventure, Chambly, Hochelaga, Hull, Montmagny, Montmorency, and Richelieu counties.

UNITED STATES:

CONNECTICUT: Fairfield, Hartford, New Haven, and New London counties.

DELAWARE: New Castle County.

GEORGIA: Charlton and Dade counties.

ILLINOIS: Champaign, Christian, Cook, Fayette, Ford, Jo Daviess, Kankakee, Lake, McHenry, McLean, Macon, Mason, Madison, Ogle, Peoria, Richland, St. Clair, Sangamon, Stark, Tazewell, Union, Vermilion, and Woodford counties.

INDIANA: Gibson, Harrison, Jasper, Kosciusko, Lake, Marion, Marshall, Monroe, Porter, Steuben, Tippecanoe, and Vermillion counties.

IOWA: Allamakee, Black Hawk, Chickasaw, Clay, Emmet, Fayette, Floyd, Kossuth, Lee, Madison, Mitchell, Palo Alto, Pottawatamie, Story, and Winneshiek counties.

KANSAS: Cherokee, Clay, Cloud, Crawford, Decatur, Dickinson, Geary, Jefferson, Osborne, Republic, Riley, Saline, Shawnee, Sheridan, Sherman, Smith, Thomas, and Wabaunsee counties.

KENTUCKY: Fayette, Pendleton, Taylor, and Warren counties.

MAINE: Androscoggin, Aroostook, Cumberland, Franklin, Kennebec, Oxford, Penobscot, Piscataquis, Sagadahoc, Somerset, and York counties.

MASSACHUSETTS: Barnstable, Berkshire, Bristol, Dukes, Essex, Franklin, Middlesex, Norfolk, Plymouth, Sussex, and Worcester counties.

MICHIGAN: Calhoun, Cheboygan, Emmet, Ingham, Mackinac, Macomb, and Van Buren counties.

MINNESOTA: Aitken, Anoka, Becker, Benton, Big Stone, Carver, Clearwater, Douglas, Hennepin, Houston, Hutchison, Kandiyohi, Lake of the Woods, Lincoln, Meeker, Otter Tail, Polk, Richland, St. Louis, Scott, Stearns, Wabasha, Winona, and Wright counties.

MISSOURI: Boone, Cape Girardeau, Cooper, Dunklin, Franklin, Jackson, Jasper, Jefferson, Knox, Marion, Pike, Ralls, St. Francois, St. Louis, and Vernon counties.

MONTANA: Hill County.

NEBRASKA: Brown, Cedar, Dodge, Douglas, Franklin, Gage, Hall, Howard, Kearney, Lancaster, Nuckolls, Sarpy, and Thomas counties.

NEW HAMPSHIRE: Belknap, Cheshire, Coos, Grafton, Hillsborough, Merrimack, and Rockingham counties.

NEW JERSEY: Burlington, Camden, Cape May, Cumberland, Essex, Mercer, Middlesex, Morris, Salem, and Somerset counties.

NEW YORK: Albany, Cattaraugus, Cayuga, Columbia, Essex, Lewis, Madison, Monroe, Oneida, Oswego, Queens, Rensselaer, St. Lawrence, Schenectady, Steuben, Suffolk, Tioga, Tompkins, Ulster, Warren, and Washington counties.

NORTH CAROLINA: Durham and Surry counties.

NORTH DAKOTA: Benson, Pembina, and Richland counties.

OHIO: Adams, Ashtabula, Athens, Auglaize, Belmont, Brown, Butler, Carroll, Clark, Columbiana, Cuyahoga, Darke, Defiance, Erie, Fairfield, Fayette, Franklin, Fulton, Gallia, Geauga, Greene, Hamilton, Hancock, Harrison, Highland, Hocking, Jefferson, Knox, Licking, Lorain, Madison, Medina, Mercer, Meigs, Miami, Monroe, Montgomery, Noble, Portage, Pickaway, Preble, Richland, Ross, Scioto, Shelby, Summit, Van Wert, Warren, and Wayne counties.

OKLAHOMA: Tulsa County.

OREGON: Marion County.

PENNSYLVANIA: Bedford, Bucks, Carbon, Centre, Chester, Delaware, Erie, Juniata, Lancaster, Lebanon, Luzerne, McKean, Monroe, Montgomery, Northampton, Philadelphia, Schuylkill, Snyder, Sullivan, and Union counties.

RHODE ISLAND: Bristol, Newport, Providence, and Washington counties.

SOUTH DAKOTA: Clay County.

TENNESSEE: Campbell, Carter, Davidson, Hawkins, Knox, Rutherford, Sevier, and Sullivan counties.

VERMONT: Addison, Bennington, Caledonia, Chittenden, Orange, Orleans, Rutland, and Windham counties.

VIRGINIA: Bedford, Fauquier, Frederick, Giles, Isle of Wight, Patrick, and Smyth counties.

WEST VIRGINIA: Barbour, Braxton, Calhoun, Hampshire, Hardy, Harrison, Jackson, Marshall, Mineral, Monongalia, Ohio, Pendleton, Pocahontas, Putnam, Randolph, Ritchie, Upshur, Wetzel, and Wirt counties.

WISCONSIN: Jefferson and Vernon counties.

Asclepias syriaca is the preeminent weedy species of the northeastern United States and this compilation of its distribution is far from complete. It apparently hybridizes occasionally with *A. amplexicaulis*, and such a putative hybrid is *A. intermedia* Vail; in its western range, however, hybridization with *A. speciosa* is

rather more frequent, and has been performed experimentally by Prof. O. A. Stevens of the North Dakota Experiment Station.

The most variable structure of *A. syriaca* seems to be the fruit, different clones or colonies frequently developing a more or less consistent form of shape and size.¹ A more significant phenomenon is a wide east-west cline with regard to the surface: the western plants being the most spiny and the eastern least so and frequently quite smooth. Doubly interesting is the complementary cline of fruits of *A. speciosa*, which range from spiny in the east to smooth in the west. The two species, although placed in different series here, are in fact extremely difficult to distinguish in the Midwest when not in flower.

37. *ASCLEPIAS HUMISTRATA* Walt. Fl. Carol. 105. 1788, ex char.

Asclepias amplexicaulis Michx. Fl. Bor.-Amer. 1:115. 1803, non Sm., ex char.

Prostrate or decumbent herbaceous perennials from a deep narrowly fusiform rootstalk. Stems rather stout, simple, 2-4 dm. long, glaucous, glabrous. Leaves opposite, sessile, very broadly ovate, apex broadly acute to obtuse, base deeply cordate and amplexicaul, 5-12 cm. long, 3-10 cm. broad, glabrous, somewhat subsucculent, glaucous, the veins usually reddish or purplish. Inflorescences terminal and usually lateral from few of the uppermost nodes, several- to many-flowered;



Fig. 43. *Asclepias humistrata* Walt.

¹My friend Dr. F. K. Sparrow (Jour. Agr. Res. 73:65. 1946) has described and figured 49 distinct pod types from twelve counties of the Lower Peninsula of Michigan. He cites 38 of these as occurring on a single experimental plot of one acre, thus indicating the variation to be genetic. Since Michigan is about midway of the cline between the predominantly spiny-fruited western races and the predominantly smooth-fruited eastern races of *A. syriaca*, the striking variation in that area may be due to recombination rather than to particularly epidemic mutation affecting the fruit.

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peduncles 4–6 cm. long, somewhat slender; pedicels slender, 1–3 cm. long. Flowers rather small; calyx lobes lanceolate, 2.5–3.0 mm. long; corolla reflexed-rotate, purplish rose, the lobes 5–6 mm. long; gynostegium pale purplish cream, shortly stipitate, the column broadly obconic, about 1 mm. long and 1.5–2.0 mm. broad, the hoods cucullate, very broadly ovate, about 3 mm. long, the horn basally adnate, falciform and incurved, slightly shorter than the hood, the anther head truncately conic, 1.5–2.0 mm. long. Follicles erect on deflexed pedicels, narrowly fusiform, 9–10 cm. long, 1.5–2.0 cm. thick, smooth, glabrous; seeds broadly oval, about 8 mm. long, the white coma 3.1–3.5 cm. long.

Sand dunes, dry oak woods, and pine barrens. North Carolina to Florida and westward to Louisiana. Blooming from April to July.

UNITED STATES:

ALABAMA: Baldwin and Mobile counties.

FLORIDA: Alachua, Baker, Bradford, Citrus, Clay, Columbia, Dade, Duval, Escambia, Hernando, Hillsborough, Lafayette, Lake, Levy, Madison, Marion, Orange, Osceola, Pasco, Pinellas, Putnam, St. Johns, Santa Rosa, Sumter, Suwannee, Volusia, and Wakulla counties.

GEORGIA: Baker, Burke, Charlton, Columbia, Dooly, Dougherty, Floyd, Liberty, Long, Lowndes, McIntosh, Richmond, Screven, Taylor, and Wheeler counties.

LOUISIANA: St. Tammany and Washington parishes.

MISSISSIPPI: Harrison and Jackson counties.

NORTH CAROLINA: Bladen, Brunswick, Carteret, Cumberland, Forsyth, Lenoir, Moore, New Hanover, Richmond, and Wayne counties.

SOUTH CAROLINA: Beaufort, Calhoun, Darlington, and Horry counties.

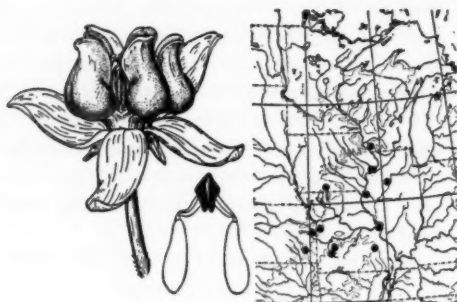
Asclepias humistrata appears to hybridize occasionally with *A. amplexicaulis*.

38. *ASCLEPIAS MEADII* Torr. ex A. Gray, Man. Bot. ed. 2, Add. 704. 1857. [T.: *Mead s. n.*, MO!]

Herbaceous perennials from a slender rootstalk. Stems rather slender, simple, 2–4 dm. tall, glabrous, glaucous. Leaves opposite, sessile, broadly ovate to ovate-lanceolate, apex acute to obtuse, base broadly obtuse to rounded, 5–7 cm. long, 1–5 cm. broad, firmly membranaceous or somewhat subsucculent, glabrous, glaucous. Inflorescences terminal and solitary, few- to several-flowered; peduncles 5–8 cm. long, rather stout; pedicels rather slender, 1.0–1.5 cm. long. Flowers rather large; calyx lobes lance-trigonal, 3–5 mm. long; corolla greenish cream more or less tinged with purple without, the lobes 7–9 mm. long; gynostegium greenish cream, very shortly stipitate, the column very broadly obconic, about 1.5 mm. long and 2.5 mm. broad, the hoods cucullate, very broadly oval, about 5 mm. long, the horn adnate toward the base, incurved and falciform, somewhat shorter than the hood, the anther head truncately conic, about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, narrowly fusiform, 8–10 cm. long, about 1 cm. broad, glabrous; seeds broadly oval, about 8 mm. long, the white coma about 4 cm. long.

Dry upland prairies and chert-lime glades, very scattered and rare. Southern Wisconsin and northern Illinois westward to Missouri and eastern Kansas. Blooming from May to June.

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Fig. 44. *Asclepias meadii* Torr.

UNITED STATES:

ILLINOIS: Hancock and Peoria counties.

IOWA: Decatur and Scott counties.

KANSAS: Allen and Miami counties.

MISSOURI: Benton, Cass, Iron, Polk, and St. Louis counties.

WISCONSIN: Grant County.

An exceedingly elusive little species in spite of the considerable area of its distribution. It has been collected only twice by my friend Dr. J. A. Steyermark, who has long been our most constant and critical student of the Missouri flora. I have never found it, although I have visited promising localities upon a number of occasions.

39. *ASCLEPIAS HYPOLEUCA* (A. Gray) Woodson, in Ann. Missouri Bot. Gard. 28:206. 1941.

Gomphocarpus hypoleucus A. Gray, in Proc. Amer. Acad. 17:222. 1881. [T.: Pringle s. n., MO!]

Herbaceous perennials. Stems rather stout, simple or rarely branching below ground, 1.5–6.0 dm. tall, finely tomentulose above to glabrate below. Leaves opposite, petiolate, broadly oblong-ovate or oval to rather narrowly oblong-elliptic, apex broadly acute to rounded, base broadly rounded, 2.5–12.0 cm. long, 2–5 cm. broad, firmly membranaceous, dark green and glabrate above, paler and densely white-tomentulose beneath; petioles 0.3–1.0 cm. long. Inflorescences usually terminal and solitary, rarely lateral also at the uppermost node, several- to many-flowered; peduncles 2–8 cm. long, rather stout; pedicels rather slender, 1–2 cm. long. Flowers large and showy; calyx lobes ovate-lanceolate, 5–6 mm. long, densely and minutely tomentulose; corolla reflexed-rotate, deep red, the lobes 1.0–1.2 cm. long; gynostegium deep red or purplish, stipitate, the column obconic, about 2 mm. long and 2.0–2.5 mm. broad, the hoods cucullate, lanceolate, narrowly

but obtusely acuminate, with very prominent marginal lobes, spreading, 7–9 mm. long, the horn when present very short and stout and very strongly adnate, apparently most frequently absent or reduced to a mere fleshy pad, the anther head truncately conic, about 2.5 mm. long and 3.5 mm. broad. Follicles erect on deflexed pedicels, unknown when mature.

Yellow pine forests in mountains, widespread but infrequent, rarely spreading to open fields. Southern New Mexico and Arizona; northern Chihuahua and north-eastern Sonora. Blooming from June to August.

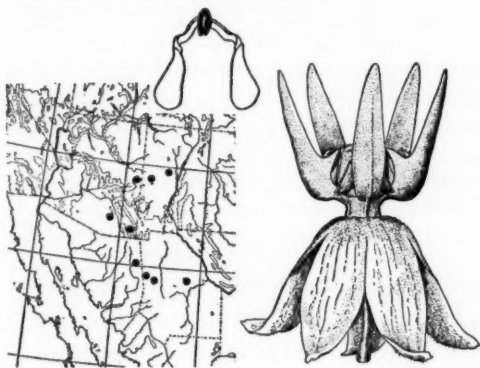


Fig. 45. *Asclepias hypoleuca* (A. Gray) Woods.

UNITED STATES:

ARIZONA: Apache, Cochise, and Pima counties.

NEW MEXICO: Catron and Socorro counties.

MEXICO: CHIHUAHUA: Concheño, Colonia García, Pinos Altos. SONORA: Puerto de los Aserraderos.

As rather frequently seems to be the case, the most obvious relationship of this handsome species appears to be *A. laxiflora* of series MACROTIDES, which has a very similar general aspect. *A. hypoleuca* is placed in SYRIACAE because of the very prominent marginal lobes of the hoods.

40. ASCLEPIAS PRINGLEI (Greenm.) Woodson, in Ann. Missouri Bot. Gard. 28:206. 1941.

Acerates humilis Benth. Pl. Hartw. 291. 1848, non *Asclepias humilis* Schltr. [T.: Hartweg s. n., K!]

Acerates Pringlei Greenm. in Proc. Amer. Acad. 34:570. 1899. [T.: Pringle 6853, MO!]

Asclepias constricta M. E. Jones, Contr. West. Bot. 12:49. 1908. [T.: Jones 318, MO!]

Asclepias phenax Woodson, in Ann. Missouri Bot. Gard. 28:206. 1941. [Based on *Acerates humilis* Benth.]

Herbaceous perennials from short fleshy horizontal rhizomes, the roots unusually thick and fleshy. Stems rather stout, simple, thickly clustered from the rhizome, 1–5 dm. tall, densely and minutely puberulent when young, becoming

glabrate. Leaves opposite, shortly petiolate, very broadly ovate to oblong-elliptic, apex broadly obtuse to acuminate, base obtuse to rounded or very broadly cordate, 4–15 cm. long, 2–7 cm. broad, firmly membranaceous, dark green above, glaucous beneath, generally puberulent, particularly beneath; petioles 0.7–1.3 cm. long. Inflorescences solitary and lateral at few to several upper nodes, usually many-flowered; peduncles rather stout, 2.5–10.0 cm. long, densely and minutely puberulent; pedicels rather slender, 1–2 cm. long. Flowers rather small; calyx lobes lanceolate, about 3 mm. long; corolla white usually tinged with purple without, the lobes 5–7 mm. long; gynostegium shortly stipitate, white, the column very broadly obconic, 0.5–1.0 mm. long and about 2 mm. broad, the hoods cucullate, oblong-ovate, somewhat spreading, about 3 mm. long, the horn frequently absent but when present strongly adnate, subacicular, much shorter than the hood, the anther head truncately conic, about 1.5 mm. long and 2.5–3.0 mm. broad. Follicles on pendulous peduncles, ovoid to broadly fusiform, 5–7 cm. long, 3–4 cm. broad, smooth, minutely pilosulose to glabrate; seeds broadly oval, about 9 mm. long, naked.

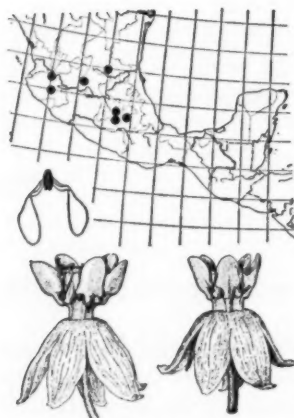


Fig. 46. *Asclepias pringlei* (Greenm.) Woods.

The frequent absence of a corona horn led both Bentham and Greenman to assign this species to *Acerates*. I believe that the horned condition may be even more frequent, however, and in all other respects *A. pringlei* has nothing in common with subgen. *ACERATES*.

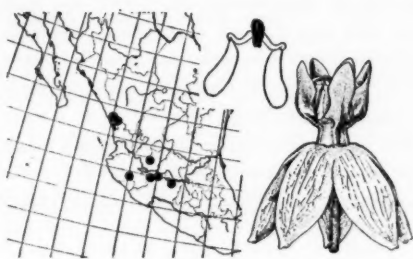
41. *ASCLEPIAS PRATENSIS* Benth. Pl. Hartw. 45. 1840. [T.: Hartweg 345, K!]

Herbaceous perennials. Stems rather slender, in small clusters from the rhizome, simple or with few weak branches from the base, 2–4 dm. tall, glabrous, glaucous. Leaves opposite, sessile or subsessile, ovate to lanceolate, apex acute to obtuse, base broadly obtuse or rounded, 4–8 cm. long, 1.5–3.0 cm. broad, firmly membra-

Open places in fir or pine woods, rocky meadows. South-central Mexico. Blooming from May to July.

MEXICO: GUANAJUATO: León. JALISCO: Tapalpa, Nevada de Colima, Mesquites, Monte Escobrado. MEXICO: El Judío, Monte de Río Frio, Plan de Salazar, Camino de Toluca, Temascaltepec. MORELOS: Serranía de Ajusco, El Parque. PUEBLA: Ixtaccihuatl. SAN LUIS POTOSÍ: Alvarez.

Like those of *A. pellucida*, the naked seeds of *A. pringlei* would appear to be modified for dissemination by water, but such does not seem to be the case! *Asclepias pringlei* is suspected of occasional hybridization with *A. lanuginosa*, and the evidence will be discussed under the latter species.

Fig. 47. *Asclepias pratensis* Benth.

ceous, glabrous, glaucous. Inflorescences solitary and terminal or lateral from few of the upper nodes, few- to several-flowered; peduncles rather slender, 1–3 cm. long; pedicels slender, 1.5–2.5 cm. long. Flowers rather small; calyx lobes ovate-lanceolate, about 3 mm. long; corolla reflexed-rotate, pale greenish white sometimes tinged with purple without, the lobes 5–7 mm. long; gynostegium shortly stipitate, white or cream, the column obconic, about 1.5 mm. long and broad, the hoods cucullate, broadly ovate, 3.5–4.0 mm. long, the horn about half adnate, falciform, somewhat shorter than the hood, the anther head truncately conic, 2.0–2.5 mm. long and 2.5–3.0 mm. broad. Follicles erect on deflexed pedicels, rather narrowly fusiform, 7–10 cm. long, about 1.5 cm. broad; seeds unknown.

Wet or low meadows, spreading to fields. South-central Mexico. Blooming from June to July.

MEXICO: JALISCO: Guadalajara, Hacienda San Marcos. MICHOACAN: Loma Santa María, Morelia, Punguato, Lake Pátzcuaro. SINALOA: Rosario, Acaponeta.

A very homogeneous little species, superficially resembling *A. ovalifolia*.

42. *ASCLEPIAS LINARIA* Cav. Ic. 1:42, *t.* 57. 1791. [T.: Herb. Cav., MO, photo!]

Asclepias filiformis Sessé & Moc. Pl. Nov. Hisp. 43. 1887. [T.: Sessé & Moc. s. n., F!]

Asclepias pinifolia Greene, in Bull. Torrey Bot. Club 8:5. 1881, ex char. [T.: Greene s. n.]

Rather low, twiggy shrubs or suffrutescent herbs 0.5–2.0 m. tall. Stems relatively slender, more or less woody and bearing the persistent bases of past leaves, branching repeatedly, minutely pilosulose when young, soon becoming glabrate. Leaves spirally approximate, crowded, sessile, filiform or acicular, 2–5 cm. long, about 1 mm. broad, revolute, rather rigid, scatteringly pilosulose to glabrate. Inflorescences lateral and solitary at few or several of the upper nodes, several- to many-flowered; peduncles moderately slender, 0.5–2.0 cm. long, pilosulose; pedicels slender, 1.5–2.0 cm. long, pilosulose. Flowers rather small, rotate or reflexed-rotate; calyx lobes lanceolate, about 3 mm. long, minutely pilosulose; corolla greenish white usually flushed with rose or purple without, the lobes 4–5 mm. long; gynostegium shortly stipitate, cream or orange (?), the column obconic, about 1 mm. long and broad, the hoods cucullate, broadly ovate, 3–4 mm. long, the horn

almost wholly adnate, much shorter than the hoods, the anther head truncately conic, about 1.5 mm. long and 2.5–3.0 mm. broad. Follicles erect on deflexed pedicels, rather broadly fusiform or napiform, narrowly attenuate, 4–5 cm. long, 1–2 cm. broad, smooth, scatteringly pilosulose to glabrate; seeds oval, about 6 mm. long, the white coma about 2 cm. long.

Open oak, pine, and juniper woodlands, dry limestone ridges, rocky hills, sandy volcanic slopes, canyons and arroyos, spreading to dry pastures and wasteland. Southern Arizona and adjacent California; virtually throughout highland Mexico. Blooming from April to November.

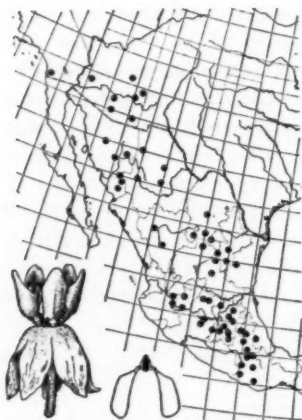


Fig. 48. *Asclepias linearis* Cav.

Tehuacán, Cerro de Guadalupe, Atlixco. QUERETARO: Quarétaro, Hacienda Ciervo. SAN LUIS POTOSÍ: San Luis Potosí, Charcas. SONORA: Pilares de Nacozari, Sierra del Pajarito, Magdalena, Los Pinitos, Aribabi, Puerto de Huépari, Río Mayo, Sierra Charuco, Río de Bavispe. TAMAULIPAS: Miquihuana. TLAXCALA: Tetlanochan. VERACRUZ: Orizaba, Acultzinco. ZACATECAS: Real de Pinos, Cedros, Concepción del Oro, Villa Nueva.

Asclepias linearis is such a characteristic and uniform species throughout its rather vast range that it is disappointing to find only two popular names recorded for it: the usual *lechitresna* in the State of Mexico, and *yerba de cuervo* in Sonora. This is one of the woodiest of the American species of *Asclepias*, and the branches and leaves might almost be mistaken for pine seedlings, as many collectors have noted.

UNITED STATES:

ARIZONA: Cochise, Gila, Graham, Greenlee, Pinal, Pima, and Yuma counties.

CALIFORNIA: San Diego County.

MEXICO: CHIHUAHUA: Sierra Charuco, Sierra Azul, Mapula, Chihuahua, Pinos Altos. COAHUILA: Saltillo, G. Cepeda, Arteaga, Fraile, Mt. Jimulco. DISTRITO FEDERAL: Contreras, Tlalpam, San Angel, Tizapan, Valle de Mexico, Lomas de Santa Fé, El Peñon, Olivar. DURANGO: Durango, San Ramón, Tobar. GUANAJUATO: Empalme de Gonzales, Guanajuato, Silao. HIDALGO: Ixmiquilpan, Jacala, Pachuca, Zimapán, Tasquillo. JALISCO: Lake Chapala, Tuxcueca, San Luis Capistrano, Huejuquilla, Villa Guadalupe, Real Alto. MEXICO: Toluca, Temascaltepec. MICHOACAN: Morelia, Santa Fé, Quirogo, Zitacuaro, Mt. Patamban. MORELOS: Tepoztlán. NUEVO LEÓN: Galeana, Doctor Arroyo. OAXACA: Mitla, Ocotlán, Coixtlahuaca, Tamazulapam, Misteca, Tlaxiaco, Teposcolula. PUEBLA: Puebla, Noria,

Series 6. PURPURASCENTES

KEY TO THE SPECIES

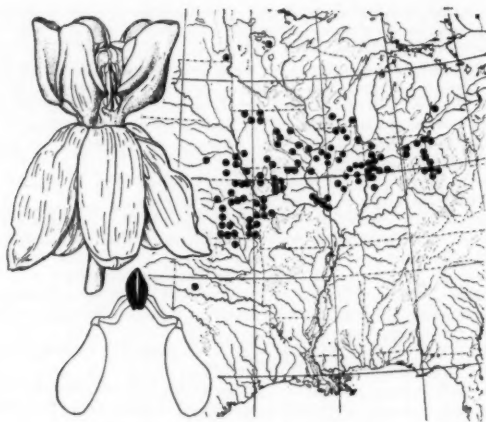
- a. Plants erect (decumbent in *A. curtisii*), relatively stout.
- b. Hoods somewhat less than twice as long as the anther head, very broadly rounded at the tip.

- c. Hoods not conduplicate; anther wings very conspicuously spurred at the base; flowers dull purplish rose; leaves sessile or subsessile. Southern Ontario; Ohio westward to eastern Nebraska and Oklahoma43. *A. sullivantii*
- cc. Hoods conduplicate; anther wings rather inconspicuously notched at the base; flowers white with a purple column; leaves distinctly petiolate. Connecticut to Florida and westward to southern Missouri and eastern Texas44. *A. variegata*
- bb. Hoods more than twice as long as the anther head, acute to acuminate.
- c. Hoods two to three times as long as the anther head, abruptly acute to acuminate, erect or only slightly spreading.
- d. Plants erect; flowers purplish rose, moderately large.
- e. Plants essentially glabrous; leaves definitely petiolate.
- f. Leaves opposite, broadly oval to ovate-oblong, obtuse. Southern Ontario; New Hampshire to Virginia and westward to eastern Kansas.....45. *A. purpurascens*
- ff. Leaves irregularly approximate, narrowly ovate to lanceolate, acute to obtusely acuminate. Wyoming and Colorado to Utah and Nevada.....46. *A. ballii*
- ee. Leaves densely white-tomentose beneath, typically very broadly ovate, cordate, sessile and amplexicaul (shortly petiolate or even nearly glabrous in putative hybrids). San Luis Potosi to Oaxaca47. *A. lanuginosa*
- dd. Plants decumbent; flowers greenish white, rather small. Peninsular Florida.....48. *A. curtisii*
- cc. Hoods three to four times as long as the anther head, gradually acuminate, widely spreading; plants densely tomentulose generally, particularly the inflorescence. Southern Manitoba to southern British Columbia; western Minnesota to northwestern Texas and westward to the Pacific Coast49. *A. speciosa*
- aa. Plants prostrate, very small in all parts; flowers pale pink; hoods twice as long as the anther head, broadly rounded at the tip. San Luis Potosi and Durango.....50. *A. euphorbiaefolia*

43. *ASCLEPIAS SULLIVANTII* Engelm. ex A. Gray, Man. Bot., ed. 1, 366. 1848.
[T.: *Sullivant* s. n., MO!]

Herbaceous perennials from a rather deep, fleshy rootstalk. Stems rather stout, simple, 6-9 dm. tall, glabrous and somewhat glaucous. Leaves opposite, sessile or subsessile, broadly oval or ovate to narrowly oblong or oblong-lanceolate, apex broadly obtuse or rounded, base broadly rounded to broadly and shallowly cordate and somewhat amplexicaul, 9-15 cm. long, 2-9 cm. broad, firmly membranaceous or somewhat succulent, glabrous, slightly glaucous. Inflorescences lateral at few to several upper nodes, several- to many-flowered; peduncles rather stout, 1-6 cm. long, glabrous; pedicels rather more slender, 2-4 cm. long. Flowers rather large; calyx lobes lance-elliptic, 5-6 mm. long; corolla purplish rose, the lobes 9-11 mm. long; gynostegium pale rose, shortly stipitate, the column broadly obconic, about 2 mm. long and 2.5-3.0 mm. broad, the hoods cucullate, broadly oval, 5-6 mm. long, the horns adnate about midway, falciform, abruptly incurved, somewhat shorter than the hood, the anther head truncately conic, about 3 mm. long and 4 mm. broad. Follicles erect on deflexed pedicels, broadly fusiform and shortly apiculate, 8-10 cm. long, usually more or less spiny, rather inconspicuously appressed-pilosulose to glabrous; seeds broadly oval, about 8 mm. long, the white coma about 4.5 cm. long.

Low prairies, alluvial meadows, and bottom-lands, spreading to roadsides. Southern Ontario; Ohio to Minnesota, Nebraska, and Oklahoma. Blooming from June to August.

Fig. 49. *Asclepias sullivantii* Engelm.

CANADA: ONTARIO: Lambton County.

UNITED STATES:

ILLINOIS: Champaign, Christian, Cook, Douglas, Ford, Fulton, Hancock, Kane, Knox, Livingston, McHenry, McLean, Macon, Madison, Peoria, Piatt, St. Clair, Sangamon, Stark, Vermilion, Will, and Winnebago counties.

INDIANA: Benton, Cass, Clinton, Jasper, Owen, Parke, Porter, Tipton, Tippecanoe, Vermillion, Warren, and Whites counties.

IOWA: Black Hawk, Clay, Decatur, Emmet, Hamilton, Iowa, Mahaska, Muscatine, Osceola, Palo Alto, Polk, Pottawattomie, Story, Union, and Van Buren counties.

KANSAS: Allen, Bourbon, Brown, Butler, Chautauqua, Cherokee, Cowley, Crawford, Dickinson, Geary, Johnson, Labette, Lincoln, Linn, McPherson, Marshall, Nemaha, Neosho, Ottawa, Riley, Saline, Sedgwick, Shawnee, Sumner, and Wabaunsee counties.

MINNESOTA: Crow Wing County.

MISSOURI: Atchison, Bates, Carroll, Cass, Chariton, De Kalb, Gentry, Grundy, Henry, Jackson, Lincoln, Linn, Livingston, St. Charles, St. Louis, Schuyler, and Scotland counties.

NEBRASKA: Cass, Gage, Hall, Lancaster, Otoe, and Sarpy counties.

NORTH DAKOTA: Richland County.

OHIO: Defiance, Delaware, Erie, Fairfield, Franklin, Madison, Marion, Ottawa, Paulding, Pickaway, Wood, and Wyandot counties.

OKLAHOMA: Comanche and Osage counties.

WISCONSIN: Dane and Racine counties.

One might expect occasional hybrids of *A. sullivantii* and *A. syriaca* or perhaps *A. amplexicaulis*, but I have seen none.

44. *ASCLEPIAS VARIEGATA* L. Sp. Pl. 215. 1753. [T.: Linn. Herb. London, no. 310.20, photo!]

Asclepias citrifolia Jacq. Coll. 2:290. 1788, ex char.

Asclepias hybridus Michx. Fl. Bor.-Amer. 1:115. 1803, ex char.

Asclepias variegata a major Hook. Fl. Bor.-Amer. 2:52. 1838. [Var. typ.]

Biventraria variegata (L.) Small, Man. Southeast. Fl. 1072. 1933.

Herbaceous perennials from a fleshy, fusiform rootstalk. Stems rather slender, simple, 3–12 dm. tall, inconspicuously pilosulose in decurrent lines from the nodes. Leaves opposite, petiolate, broadly oval, apex broadly obtuse to broadly acute, base very broadly obtuse or rounded, 8–15 cm. long, 4–9 cm. broad, dark green and glabrous above, glaucous and very sparsely pilosulose beneath; petioles 1–2 cm. long. Inflorescences usually solitary and terminal, occasionally also lateral from very few of the uppermost nodes, rather many-flowered and very compactly hemispherical; peduncles rather slender, 1–7 cm. long; pedicels 1–2 cm. long. Flowers rather large and showy; calyx lobes ovate, about 3 mm. long; corolla rotate, white, the lobes 7–8 mm. long; gynostegium white save the purple column, shortly stipitate, the column obconic, about 1.5 mm. long and 2.0–2.5 mm. broad, the hoods cucullate, conduplicate and inflated, very broadly obovate, about 2.5 mm. long, the horn adnate toward the base, falciform and sharply inflexed, much shorter than the hood, the anther head about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, narrowly fusiform, gradually apiculate, 10–15 cm. long, 1.5–2.0 cm. thick, glaucous, minutely pilosulose; seeds oval, about 5 mm. long, the white coma 2.5–4.5 cm. long.

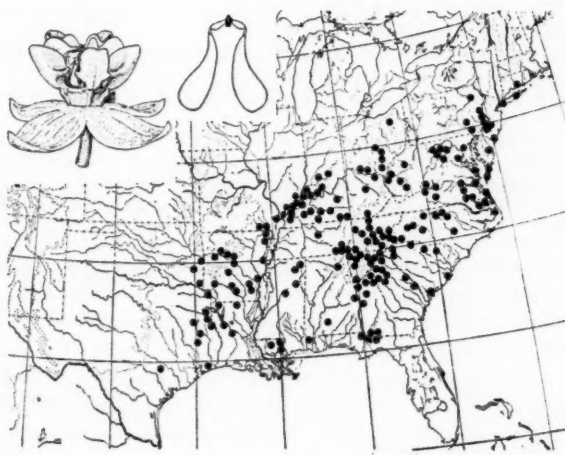


Fig. 50. *Asclepias variegata* L.

Thickets and open woods, usually in sandy or rocky soil. Connecticut to northern Florida and westward to southern Missouri and eastern Texas. Blooming from May to July.

UNITED STATES:

ALABAMA: Conecuh, Lee, Marshall, and Mobile counties.

ARKANSAS: Calhoun, Conway, Craighead, Drew, Faulkner, Greene, Hempstead, Hot Springs, Lincoln, Logan, Ouachita, Phillips, Pope, Pulaski, and St. Francis counties.

CONNECTICUT: Middlesex County.

DELAWARE: Sussex County.

FLORIDA: Gadsden, Jackson, and Leon counties.

GEORGIA: Banks, Barrow, Carroll, Clarke, Cobb, Dade, Dawson, Decatur, De Kalb, Floyd, Forsyth, Fulton, Gwinnett, Heard, Jackson, Meriwether, Murray, Muscogee, Rabun, Richmond, Screven, Thomas, Walker, and White counties.

ILLINOIS: Alexander, Gallatin, Hardin, Johnson, Massac, and Pope counties.

INDIANA: Crawford, Gibson, Jackson, Martin, Perry, Posey, and Spencer counties.

KENTUCKY: Bell, Caldwell, Edmonson, Hopkins, Lewis, Logan, McCracken, McCreary, Nelson, Union, Warren, Whitley, and Wolfe counties.

LOUISIANA: Bossier, Lincoln, Natchitoches, Rapides, St. Tammany, Tangipahoa, and Washington parishes.

MARYLAND: Prince Georges County.

MISSISSIPPI: Attala, Lee, Oktibbeha, and Prentiss counties.

MISSOURI: Butler, Ripley, and Scott counties.

NEW JERSEY: Burlington, Camden, and Cape May counties.

NEW YORK: Queens and Suffolk counties.

NORTH CAROLINA: Alexander, Buncombe, Cumberland, Durham, Forsyth, Haywood, Henderson, Iredell, Macon, Madison, Orange, Pasquotank, Perquimans, Polk, Rowan, Swain, and Wake counties.

OHIO: Adams, Fairfield, Franklin, Hocking, Jackson, Scioto, and Scott counties.

OKLAHOMA: Latimer, Le Flore, and McCurtain counties.

PENNSYLVANIA: Bucks, Lancaster, Lebanon, Luzerne, Northampton, and Philadelphia counties.

SOUTH CAROLINA: Anderson, Beaufort, Charleston, Cherokee, Darlington, Lancaster, and Pickens counties.

TENNESSEE: Blount, Bradley, Davidson, Franklin, Grundy, Hamilton, Knox, Marion, Monroe, Morgan, Roane, Sevier, and Union counties.

TEXAS: Angelina, Bowie, Cherokee, Gonzales, Harrison, Jefferson, Panola, Polk, and Shelby counties.

VIRGINIA: Accomac, Allegheny, Bedford, Campbell, Craig, Dinwiddie, Frederick, Greensville, Henrico, James City, Lancaster, Northampton, Prince George, Prince William, Princess Anne, Shenandoah, and Southampton counties.

WEST VIRGINIA: Cabell, Calhoun, Hampshire, Hardy, Kanawha, Mineral, Raleigh, and Wayne counties.

The glistening white flowers are so tightly compacted into the hemispheric inflorescences that no spaces appear between them, and the general effect is of a small snowball, with an iridescent quality imparted by the purple columns. One of the most beautiful of all milkweeds.

There are no specimens of *A. variegata* labelled as such by Linnaeus or his son in the Linnean Herbarium. However, there are two sheets labelled *A. nivea* obviously in error, and a third labelled *Asclepias dilatata*, a manuscript name perhaps exchanged by Linnaeus for the somewhat more descriptive *variegata*. I am choosing the latter as the lectotype.

45. *ASCLEPIAS PURPURASCENS* L. Sp. Pl. 214. 1753, ex char.

Asclepias amoena L. loc. cit. 1753, ex char.

Asclepias compressa Moench, Meth. 717. 1794, ex char.

Asclepias dasyphus Raf. Atl. Jour. 152. 1832, ex char.

Asclepias lasiotis Raf. Aut. Bot. 178. 1840, ex char.

Asclepias gonialis Raf. loc. cit. 1840, ex char.

Herbaceous perennials. Stems rather stout, simple, 4–10 dm. tall, minutely pilosulose when young, becoming glabrate. Leaves opposite, petiolate, broadly ovate or oval to ovate- or oblong-lanceolate, apex obtuse to acute, base obtuse to broadly rounded and very shortly and abruptly cuneate into the petiole, 6–18 cm. long, 3–10 cm. broad, firmly membranaceous, dark green and glabrate above, paler and densely and generally puberulent below; petioles 0.5–2.5 cm. long. Inflorescences terminal and solitary or paired, occasionally accompanied by very few at the uppermost nodes, several- to rather many-flowered; peduncles rather slender, 1.5–9.0 cm. long, minutely puberulent; pedicels slender, 2.0–3.5 cm. long, minutely puberulent. Flowers rather large and very showy; calyx lobes ovate-lanceolate, 3–4 mm. long, minutely puberulent; corolla deep rose, reflexed-rotate, the lobes 7–10 mm. long; gynostegium deep rose, very shortly stipitate, the column obconic, 1.5–2.0 mm. long, 2.5–3.0 mm. broad, the hoods oblong-elliptic, acute to acumi-

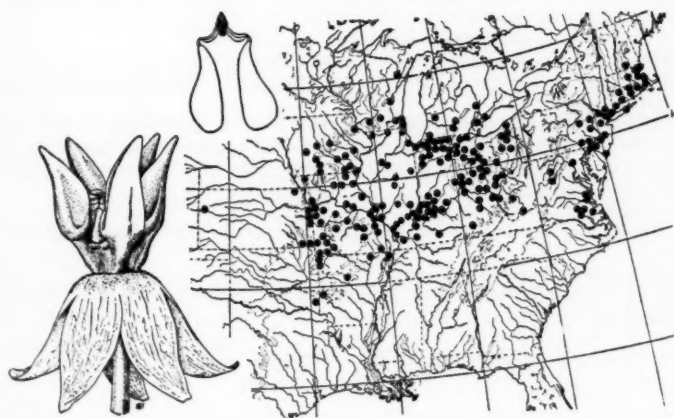


Fig. 51. *Asclepias purpurascens* L.

nate, 6–7 mm. long, the horn about half adnate, falciform and sharply incurved, much shorter than the hoods, the anther head truncately conic, about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, narrowly fusiform, gradually attenuate, 10–16 cm. long, about 1–2 cm. thick, smooth, minutely puberulent to glabrate; seeds oval, 5–6 mm. long, the white coma 3.5–4.5 cm. long.

Thickets and open woods, prairies and fields, spreading to roadsides and railways. Southern Ontario; New Hampshire to Virginia and westward to eastern Kansas.

CANADA: ONTARIO: Essex and Lambton counties.

UNITED STATES:

ARKANSAS: Benton, Faulkner, Polk, Randolph, and Washington counties.

CONNECTICUT: Fairfield, Hartford, New Haven, New London, and Windham counties.

DELAWARE: New Castle County.

DISTRICT OF COLUMBIA.

ILLINOIS: Christian, Cook, Fayette, Jefferson, Jo Daviess, Lake, McHenry, Macon, Madison, Peoria, Pulaski, Randolph, Richland, St. Clair, Union, Vermilion, Wabash, and Wayne counties.

INDIANA: Allen, Cass, Clark, Crawford, Daviess, Dubois, Elkhart, Franklin, Fulton, Gibson, Grant, Greene, Harrison, Knox, Kosciusko, Lake, La Porte, Lawrence, Martin, Noble, Perry, Porter, Pulaski, Spencer, Steuben, Vanderburgh, Warrick, Wells, and White counties.

IOWA: Audubon, Boone, Clarke, Clayton, Decatur, Henry, Iowa, Johnson, Lee, Madison, Mahaska, Story, and Van Buren counties.

KANSAS: Brown, Cherokee, Johnson, Labette, Miami, Wallace, and Wyandotte counties.

KENTUCKY: Boyd, Caldwell, Campbell, Fleming, McCracken, Powell, Pulaski, Union, and Warren counties.

MASSACHUSETTS: Bristol, Essex, Middlesex, Norfolk, Suffolk, and Worcester counties.

MICHIGAN: Cass, Ingham, Jackson, Kent, and St. Clair counties.

MISSOURI: Boone, Butler, Callaway, Cass, Christian, Clay, Dade, Dallas, Dent, Dunklin, Franklin, Greene, Jackson, Jasper, Jefferson, Johnson, Linn, McDonald, Macon, Madison, Marion, Morgan, Nodaway, Phelps, Pike, Pulaski, St. Clair, St. Francois, St. Louis, Scotland, Shannon, and Stone counties.

NEW HAMPSHIRE: Hillsborough County.

NEW YORK: Bronx, Rockland, and Suffolk counties.

NEW JERSEY: Burlington, Camden, Cape May, Essex, Gloucester, Salem, Somerset, Sussex, and Union counties.

OHIO: Adams, Allen, Athens, Auglaize, Butler, Carroll, Champaign, Clark, Coshocton, Defiance, Fairfield, Fulton, Gallia, Hamilton, Hocking, Jackson, Lake, Lucas, Marion, Madison, Meigs, Paulding, Pickaway, Portage, Ross, Scioto, Stark, Summit, Vinton, Warren, and Wyandotte counties.

OKLAHOMA: McCurtain County.

PENNSYLVANIA: Bucks, Chester, Delaware, Lancaster, Northampton, and Schuylkill counties.

RHODE ISLAND: Providence County.

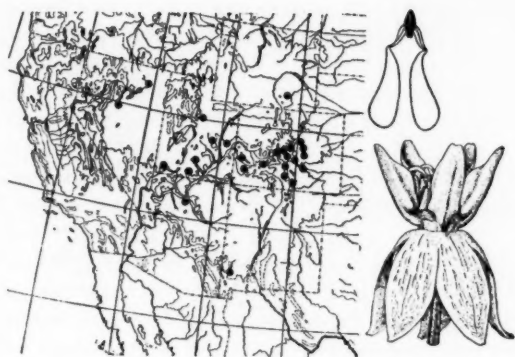
VIRGINIA: Dinwiddie, Greenville, James City, Nansemond, Shenandoah, Sussex, and York counties.

46. *ASCLEPIAS HALLII* A. Gray, in Proc. Amer. Acad. 12:69. 1877. [T.: *E. Hall* 480, MO!]

Asclepias curvipes A. Nels. in Bull. Torrey Bot. Club 28:299. 1901. [T.: *Nelson* 1656, MO!]

Asclepias lonchophylla Greene, Leaf. Bot. Obs. & Crit. 2:231. 1912. [T.: *Purpus s. n.*, MO!]

Herbaceous perennials. Stems usually relatively slender, usually simple but occasionally sparingly branched toward the base, 2–5 dm. tall, densely and minutely puberulent to glabrate. Leaves irregularly approximate, shortly petiolate, ovate to broadly lanceolate, apex acute to obtuse, base obtuse to rounded, 5–15 cm. long, 1.5–4.0 cm. broad, firmly membranaceous, somewhat glaucous, minutely and generally puberulent, particularly beneath; petioles 0.6–1.5 cm. long. Inflorescences lateral and solitary at few to several of the upper nodes, several- to many-flowered; peduncles minutely puberulent, 1–5 cm. long; pedicels more slender, minutely puberulent, 1.5–2.5 cm. long. Flowers rather large; calyx lobes lanceolate, about 3 mm. long, minutely puberulent; corolla reflexed-rotate, rather pale livid rose or

Fig. 52. *Asclepias ballii* A. Gray

purple, the lobes 6–8 mm. long; gynostegium pale rose to cream, shortly stipitate, the column obconic, about 1 mm. long and 1.5 mm. broad, the hoods oblong-elliptic, acute, 4.5–5.0 mm. long, the horn adnate about the middle, falciform, abruptly incurved, shorter than the hood, the anther head truncately conic, about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, rather broadly fusiform and shortly apiculate, 8–12 cm. long, 1–3 cm. broad, smooth, minutely puberulent to glabrate; seeds broadly oval, about 7 mm. long, the white coma about 3.5 cm. long.

Stony slopes with pinyon and juniper, sagebrush, or yellow pine, sometimes spreading to roadsides. Wyoming and Colorado to Nevada and northern Arizona. Blooming from June to August.

UNITED STATES:

ARIZONA: Coconino County.

COLORADO: Chaffee, Costilla, Denver, Douglas, El Paso, Fremont, Gunnison, Jefferson, Lake, Montrose, Ouray, Park, Pueblo, Rio Grande, Saguache, and San Miguel counties.

NEVADA: Elko and Lander counties.

NEW MEXICO: Grant County.

UTAH: Emery, Garfield, Grand, Kane, Utah, and Washington counties.

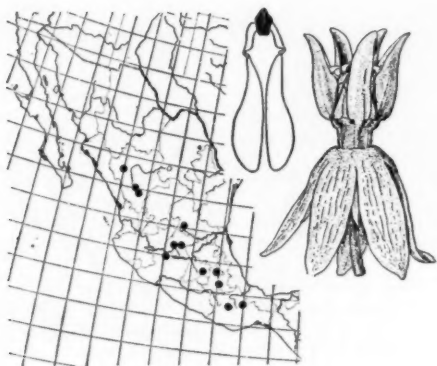
WYOMING: Albany County.

47. *ASCLEPIAS LANUGINOSA* HBK. Nov. Gen. 3:193. 1819. [T.: *Bonpland* 4056, MO, photo!]

Asclepias otarioides Fourn. in Ann. Sci. Nat. Bot. Ser. VI, 14:373. 1882, ex char. [T.: *Uhde* 733.]

Asclepias scheryi Woodson, in Ann. Missouri Bot. Gard. 28:285. 1941. [T.: *Schery* 167, MO!]

Herbaceous perennials. Stems stout, simple, 8–12 dm. tall, densely white-tomentose when young, becoming glabrate. Leaves opposite, sessile, very broadly ovate or oval to oblong, apex very broadly obtuse to rounded, base broadly cordate

Fig. 53. *Asclepias lanuginosa* HBK.

and amplexicaul (shortly petiolate and rounded in certain putative hybrids), 10–20 cm. long, 6–14 cm. broad, firmly membranaceous, dark green and glabrate above, paler and densely white-tomentose beneath (glabrous or nearly so in certain putative hybrids). Inflorescences solitary and lateral at few to several of the uppermost nodes, usually many-flowered; peduncles rather stout, 3–10 cm. long, softly tomentose; pedicels more slender, 2–3 cm. long, tomentulose. Flowers large and showy; calyx lobes lanceolate, about 6 mm. long, minutely tomentulose or puberulent, purple; corolla reflexed-rotate, purplish rose, sometimes greenish within, the lobes 8–9 mm. long; gynostegium pale purplish to cream, shortly stipitate, the column obconic, 1.5–2.0 mm. long, 2.5–3.0 mm. broad, the hoods ovate-lanceolate, acuminate, 6–8 mm. long, the horn adnate to about the middle, rather narrowly falciform and gradually incurved, about as long as the hood, the anther head rather narrowly truncate-conic, about 2.5 mm. long and 3.0–3.5 mm. broad. Follicles erect on deflexed pedicels, rather narrowly fusiform, gradually apiculate, 10–13 cm. long, about 1.5–2.0 cm. broad, rather sparsely white-tomentose to glabrate; seeds oval, about 6 mm. long, the white coma about 4 cm. long.

Mountain slopes, sparsely wooded grassland, open places in pine and oak woods, lava beds. South-central Mexico. Blooming from June to August.

MEXICO: DURANGO: Otinapa, Indé, Coyotes Hacienda, Arroyo Mimbres. DISTRITO FEDERAL: Eslava, Valley of Mexico. GUANAJUATO: Santa Rosa. MICHOACAN: Pátzcuaro. OAXACA: Sierra de San Felipe, Montelobos, Nochixtlán, Etla. PUEBLA: Cerro de Chicamola, San Luis. SAN LUIS POTOSÍ: Alvarez, San Luis Potosí. TLAXCALA: Tlaxcala.

Dugès reports the popular name of *taraumara*.

Typical *A. lanuginosa* is quite unlike any other Mexican milkweed, with its broad leaves densely white-tomentose beneath, and its handsome purplish rose flowers. However, many specimens in our herbarium collections which are quite obviously of the same species have large but proportionately narrower leaves defi-

nately petiolate and scarcely if at all cordate, and flowers that are frequently somewhat smaller as well; still others have conspicuously smaller and paler flowers and smaller, less conspicuously tomentose leaves. One specimen of the latter series (*Schery 167*) has the smaller flowers combined with deeply cordate and amplexicaul leaves of the type of true *A. lanuginosa*, but virtually glabrous or only inconspicuously puberulent beneath.

Such evidence leads me to suppose that *A. lanuginosa* hybridizes quite frequently with some neighboring species, of which the most likely candidate appears to be either *A. ovata* or *A. pringlei*.

Although superficially rather similar because of their rather small, inconspicuously puberulent leaves and crowded smallish flowers, *A. ovata* and *A. pringlei* are very easy to tell apart: *A. ovata* by its long narrow column, long anther head, and shortly stipitate hoods with slender horns; *A. pringlei* by its very short column, short and broad anther head, and conspicuously stipitate hoods with very short horns, if any. Both species occur within the range of *A. lanuginosa*, which, because of its rather narrow column and anther head, might also be placed as well in the series TUBEROSAE as in the PURPURASCENTES (I have placed it in the latter because of the absence of marginal auricles to the hoods).

Asclepias pringlei might appear to be a poor candidate for hybridization with *A. lanuginosa* not only because of its column and anther heads which are proportionally less like the latter species than those of *A. ovata*, but particularly because of its peculiar pendulous follicles with naked seeds. Nevertheless, an examination of the putative hybrids definitely shows a strong tendency for both the column and the hood to be short and squat much more in the manner of *pringlei* than of *ovata*, and I have been driven rather reluctantly to the conclusion that the putative hybrids most likely are products of cross pollination of *A. lanuginosa* \times *pringlei*, and I am labelling the herbarium specimens as such.

Here, again, one is bound to question the close analysis of floral structures (or fruiting for that matter) as clues to true natural relationships in the asclepiads, and to doubt whether a trustworthy phylogeny of the family can ever be reconstructed.

Unfortunately, the type specimen of *A. lanuginosa* is one of the putative hybrids. The supposedly homozygous population is represented by Fournier's description of *A. otarioides*, the type specimen of which was said by him to be deposited at Berlin and hence is supposedly lost. Most of the putative hybrids in our herbarium collections have been determined previously as *A. ovata*, which they indeed approach in superficial appearance except for the somewhat larger flowers and leaves (although the gynostegia are quite different as has already been discussed). The type specimen of *A. scheryi* is of particular interest since it approaches *A. pringlei* so closely in the flowers and *A. lanuginosa* in the leaves (except for the lack of the characteristic tomentum).

48. *Asclepias curtissii* A. Gray, in Proc. Amer. Acad. 19:85. 1883. [T.: *Curtiss s. n.*, MO!]

Asclepias aceratoides Nash, in Bull. Torrey Bot. Club 22:154. 1895, non M. A. Curtis. [T.: Nash 1092, MO!]

Asclepias arenicola Nash, loc. cit. 23:252. 1896. [Based on *A. aceratoides* Nash, non M. A. Curtis.]

Oxypteryx arenicola (Nash) Greene, in Pittonia 3:235. 1897.

Oxypteryx curtissii (A. Gray) Small, Man. Southeast. Fl. 1072. 1933.

Decumbent herbaceous perennials from fleshy fusiform rootstalks. Stems relatively slender, simple or branching sparingly, 3–7 dm. long, inconspicuously puberulent to glabrate. Leaves opposite, petiolate, broadly oval or ovate and almost quadrate, apex broadly obtuse to broadly rounded and more or less retuse with a short mucro, base broadly rounded, 2–5 cm. long, 1.5–3.0 cm. broad, firmly membranaceous, glabrous; petioles 4–7 mm. long. Inflorescences solitary and lateral at few to several of the uppermost nodes, rather many-flowered; peduncles rather slender, 2.5–4.0 cm. long, finely puberulent; pedicels slender, 1.0–1.5 cm. long, minutely puberulent. Flowers rather small; calyx lobes narrowly lanceolate, 2.5–3.0 mm. long; corolla reflexed-rotate, pale green or greenish white, the lobes about 6 mm. long; gynostegium subsessile, white or cream, the column very broadly obconic, about 0.5 mm. long and 2 mm. broad, the hoods oblong-lanceolate, narrowly acute, 4.5–5.0 mm. long, the horn about half adnate, falciform and sharply incurved, much shorter than the hoods, the anther head very broadly truncate-conic, about 1.5 mm. long and 3 mm. broad. Follicles unknown.

Dry sandy scrub and pinelands. Southern Florida. Blooming from April to August.

UNITED STATES:

FLORIDA: Brevard, Collier, De Soto, Highlands, Lake, Marion, Orange, Osceola, Palm Beach, and Pinellas counties.

A most peculiar little species rather resembling a white-flowered *A. tuberosa* at a casual glance. Definitely of the affinity of *A. purpurascens*, however.

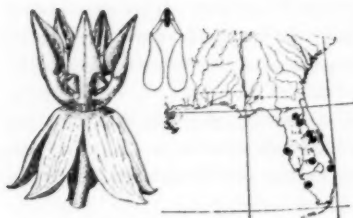
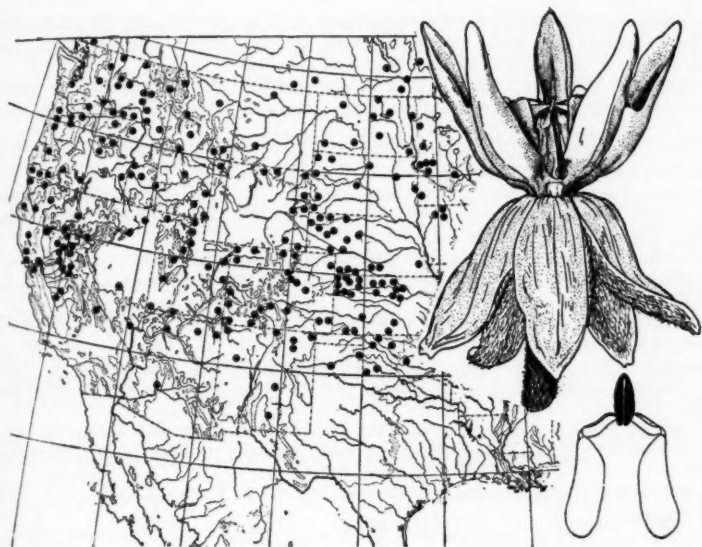


Fig. 34. *Asclepias curtissii* A. Gray

49. *Asclepias speciosa* Torr. in Ann. Lyc. N. Y. 2:218. 1828, ex char. [T.: James 258.]

Asclepias douglasii Hook. Fl. Bor.-Amer. 2:53, t. 142. 1840, ex ic.

Herbaceous perennials. Stems usually very stout, simple, 6–10 dm. tall, densely white-tomentose generally. Leaves opposite, shortly petiolate, broadly ovate or oval to rather narrowly oblong or ovate-lanceolate, apex usually very broadly obtuse to rounded, rather rarely acute, base very broadly obtuse to rounded and sometimes broadly and shallowly cordate, 6–20 cm. long, 3–14 cm. broad, firmly membra-

Fig. 55. *Asclepias speciosa* Torr.

naeous, very densely white-tomentose beneath, more or less glabrate above; petioles 0.5–1.5 cm. long. Inflorescences lateral and solitary at few to several of the upper nodes, several- to many-flowered, densely white-tomentose throughout; peduncles rather stout, 1–10 cm. long; pedicels 2–3 cm. long. Flowers very large and showy; calyx lobes lanceolate, 5–6 mm. long, very densely white-tomentose; corolla purplish rose, the lobes 10–15 mm. long; gynostegium pale rose or pinkish cream, subsessile, the column very broadly obconic, about 1 mm. long and 3 mm. broad, the hoods very narrowly ovate-lanceolate, gradually attenuate, widely spreading, 10–14 mm. long, the horn adnate toward the base, falciform-acicular, sharply incurved, very much shorter than the hoods, the anther head broadly truncate-conic, about 3 mm. long and 4.5 mm. broad. Follicles erect on deflexed pedicels, broadly or rather narrowly fusiform, abruptly or gradually attenuate, 9–12 cm. long, 2–3 cm. broad, densely spiny to smooth, very densely white-tomentose; seeds oval, 6–9 mm. long, the white coma 3–4 cm. broad.

Widely tolerant to habitat and becoming weedy in cultivated fields, roadsides, and railways. Southern Manitoba to British Columbia; Minnesota to northwestern Texas and westward to the Pacific Coast. Blooming from May to September.

CANADA: MANITOBA: Gladstone, Lakeside, Morden, and Winnipeg. SASKATCHEWAN: Maple Creek and Willow Bunch. BRITISH COLUMBIA: Kimberly.

UNITED STATES:

ARIZONA: Apache, Coconino, Maricopa, and Navajo counties.

CALIFORNIA: Amador, Butte, Calaveras, Contra Costa, Del Norte, Eldorado, Fresno, Humboldt, Inyo, Lake, Marin, Mariposa, Mono, Nevada, Placer, Plumas, Shasta, Sierra, Solano, Siskiyou, Sonoma, Trinity, and Tuolumne counties.

COLORADO: Archuleta, Bent, Boulder, Denver, Elbert, El Paso, Fremont, Jefferson, Larimer, Mesa, Mineral, Moffatt, Montezuma, Montrose, Prowers, Rio Blanco, Routt, Saguache, Weld, and Yuma counties.

IDAHO: Ada, Bannock, Butte, Bonneville, Canyon, Goodding, Idaho, Kootenai, Latah, Lemhi, Nez Perce, and Payette counties.

KANSAS: Cheyenne, Clay, Cloud, Decatur, Ellis, Gove, Graham, Harper, Harvey, Logan, Meade, Norton, Osborne, Ottawa, Pawnee, Rawlins, Riley, Rooks, Saline, Seward, Sheridan, Sherman, and Wallace counties.

IOWA: Clay, Emmet, and Palo Alto counties.

MINNESOTA: Big Stone, Chippewa, Hennepin, Kandiyohi, Mahnomen, Otter Tail, Pipestone, Polk, and Swift counties.

MONTANA: Deer Lodge, Flathead, Gallatin, Lewis and Clark, Missoula, Park, Phillips, Sanders, and Yellowstone counties.

NEBRASKA: Box Butte, Cherry, Cheyenne, Custer, Dawes, Deuel, Dundy, Garden, Grant, Kearney, Lancaster, Lincoln, Phelps, Red Willow, Sheridan, Sioux, and Thomas counties.

NEVADA: Churchill, Clark, Douglas, Elko, Eureka, Nye, Storey, and Washoe counties.

NEW MEXICO: Lincoln, Mora, Otero, San Juan, San Miguel, Taos, Union, and Valencia counties.

NORTH DAKOTA: Benson, Morton, Ramsey, Richland, Stutman, Slope, Towner, and Ward counties.

OKLAHOMA: Beckham, Major, Oklahoma, Washita, Woods, and Woodward counties.

OREGON: Benton, Clackamas, Crook, Curry, Grant, Hood River, Jackson, Josephine, Klamath, Lake, Lane, Malheur, Marion, Polk, Umatilla, Union, Wheeler, and Yamhill counties.

SOUTH DAKOTA: Brookings, Butte, Fall River, Harding, Pennington, Perkins, Spink, Stanley, and Walworth counties.

TEXAS: Hemphill and Randall counties.

UTAH: Box Elder, Cache, Carbon, Grand, Juab, Kane, Millard, Salt Lake, San Juan, Uintah, Utah, and Washington counties.

WASHINGTON: Benton, Chelan, Columbia, Douglas, Grant, Kittitas, Lincoln, Okanogan, Skamania, Stevens, Spokane, Thurston, Walla Walla, Whitman, and Yakima counties.

WYOMING: Albany, Bighorn, Converse, Crook, Laramie, Niobrara, Sheridan, Weston, and Yellowstone counties.

Asclepias speciosa bears the most massive flowers of the American milkweeds and the inflorescences are quite handsome when studied individually, in spite of lack of a clear color. Nevertheless, the plants are rather weedy and not likely to be cultivated. In Minnesota, Iowa, and the Dakotas occasional spontaneous hybrids with *A. syriaca* are found, and the cross has been performed experimentally by Prof. O. A. Stevens, of the North Dakota Experiment Station. As has already been discussed under *A. syriaca*, a broad east-west cline exists in *A. speciosa* with respect to the follicles, which tend to be conspicuously spiny in the east and smooth in the west; a complementary cline is found in *A. syriaca*.

50. *ASCLEPIAS EUPHORBIAEFOLIA* Engelm. ex A. Gray, in Proc. Amer. Acad. 16:104. 1881. [T.: *Schaffner* 55, MO!]

Small prostrate herbaceous perennials. Stems very slender, simple, clustered from the rootstalk, 5–9 cm. long, very minutely puberulent. Leaves opposite,

petiolate, very broadly ovate, suborbicular, apex very broadly obtuse to rounded, base broadly rounded, 4–9 mm. long, 4–5 mm. broad, subsucculent, glabrous; petioles 1–2 mm. long. Inflorescences subterminal from 1 to few uppermost nodes, few-flowered; peduncle slender, 1–2 cm. long or nearly sessile, minutely puberulent; pedicels very slender, about 1 cm. long. Flowers small; calyx lobes ovate, about 2 mm. long; corolla pale pink, the lobes about 4 mm. long; gynostegium subsessile, pale pinkish cream, the column broadly obconic, about 1 mm. long and 1.5 mm. broad, the hoods oblong-elliptic, spreading, about 3 mm. long, the horn adnate about midway, falciform and incurved, shorter than the hood, the anther head truncately conic, about 1 mm. long and 2.5 mm. broad. Follicles erect on deflexed pedicels, narrowly fusiform, long-apiculate, about 3 cm. long and 5 mm. thick, smooth, very minutely and sparsely pilosulose; seeds unknown.

Dry, open, rocky woodlands of oak, pine, and arbutus; in sandy soil. Durango and San Luis Potosí. Blooming in July and August.

MEXICO: DURANGO: Cerro Prieto. SAN LUIS POTOSÍ: San Miguelito.

Only four collections of *A. euphorbiaefolia* are known, three from San Luis Potosí (Schaffner in 1876 and 1879, Parry & Palmer in 1878), and the last from Durango (James H. Maysilles in 1950). Mr. Maysilles' notes are of particular interest therefore: "Rare; only 1 mat seen; plants

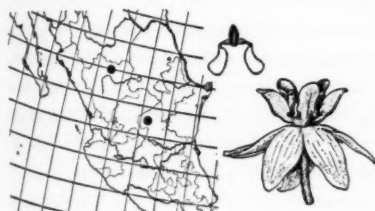


Fig. 56. *Asclepias euphorbiaefolia* Engelm.

were lying flat on ground; flowers looked like pink cloverbloom from a distance of 2 meters away."

Series 7. MACROTIDES

KEY TO THE SPECIES

- a. Flowers relatively small, the corolla lobes about 4–8 mm. long, greenish white more or less suffused with purple.
- b. Leaves irregularly approximate.
- c. Inflorescence pedunculate or infrequently subtended by a reduced leaf; leaves rather uniformly linear to filiform.
- d. Inflorescences typically terminal and solitary, rather long-pedunculate; follicles erect on erect pedicels. Coastal Plain from South Carolina to Louisiana.....51. *A. michauxii*
- dd. Inflorescences lateral at several upper nodes, very shortly pedunculate; follicles known. Oaxaca.....52. *A. conzattii*
- cc. Inflorescences sessile and typically subtended by few to several leaves; leaves variable, broadly ovate to narrowly lanceolate.
- d. Plants inconspicuously puberulent; leaves lanceolate; hoods about twice as long as the anther head. New Mexico and adjacent Kansas and Colorado to southern Arizona and southward to Coahuila and Durango.....53. *A. involucreata*
- dd. Plants conspicuously tomentulose; leaves broadly ovate to ovate-lanceolate; hoods barely longer than the anther head. Southern Utah and northern Arizona.....54. *A. macrostigma*
- bb. Leaves opposite.

- c. Leaves ovate to narrowly lanceolate, abruptly cuneate; hoods rather obtuse, barely longer than the anther head; small herbs. San Luis Potosí and Hidalgo.....55. *A. puberula*
 cc. Leaves filiform to acicular; hoods narrowly acuminate, about three times as long as the anther head; plants suffrutescent. Western Texas to southern New Mexico and Arizona; Coahuila56. *A. macrotis*
 aa. Flowers relatively large, the corolla lobes about 1 cm. long.
 b. Plants very stout, conspicuously setose-pilose generally; leaves very broadly and regularly oval, subsessile, cordate and rather amplexicaul; flowers very many and crowded, pale green. Southern Arizona; Chihuahua to Sonora and southward to Jalisco.....57. *A. lemmoni*
 bb. Plants more slender, inconspicuously puberulent to glabrate; leaves broadly ovate to ovate-lanceolate, obtuse to rounded at the base, distinctly petiolate; flowers rather few and lax, deep purple. Oaxaca58. *A. laxiflora*

51. *ASCLEPIAS MICHAUXII* Dcne. in DC. Prodr. 8:569. 1844, ex char. [T.: *Micbaux s. n.*]

Asclepias angustifolia Ell. Sketch Bot. South Car. & Ga. 1:325. 1821. [T.: Elliot Herb., Charleston Mus., GH photo!]

Oligoron tenuifolium Raf. New Fl. North Amer. 4:60. 1838, ex char.

Herbaceous perennials from rather fleshy, subfusiform rootstalks. Stems slender, simple or sparingly branched from the base, decumbent or ascending, 1-4 dm. long, minutely and rather sparsely pilosulose to glabrate. Leaves irregularly approximate, sessile, linear to filiform, 3-12 cm. long, 1-6 mm. broad, firmly membranaceous and frequently somewhat revolute, very minutely and sparsely pilosulose to essentially glabrous. Inflorescences terminal and solitary or very rarely lateral also at the uppermost node, usually long-pedunculate but rarely immediately subtended by a reduced leaf, several- to many-flowered; peduncles 3-6 cm. long, rarely absent; pedicels slender, 0.9-1.3 cm. long, very minutely and scatteringly pilosulose. Flowers rather mediocre; calyx lobes lanceolate, 2.5-4.0 mm. long; corolla reflexed, rotate, greenish white and usually more or less suffused with purple without, the lobes 4-6 mm. long; gynostegium stipitate, white, the column obconic, about 1



Fig. 57. *Asclepias michauxii* Dcne.

mm. long and 1.5 mm. broad, the hoods ovate, acute, 2-4 mm. long, the horn adnate toward the base, falciform and incurved, about as long as the hood, the anther head truncately conic, about 1.5 mm. long and 2 mm. broad. Follicles erect on erect pedicels, very narrowly fusiform, long-attenuate, 10-15 cm. long, 5-8 mm. broad, smooth, essentially glabrous; seeds broadly oval, about 8 mm. long, the white coma 4.0-4.5 cm. long.

Sandy pine barrens. South Carolina to Florida and westward to Louisiana. Blooming from April to June.

UNITED STATES:

ALABAMA: Baldwin and Mobile counties.

FLORIDA: Alachua, Baker, Bay, Bradford, Calhoun, Clay, Columbia, Duval, Franklin, Gulf, Manatee, Nassau, and Putnam counties.

GEORGIA: Berrien, Early, Laurens, Lowndes, Sumter, Wayne, and Washington counties.

LOUISIANA: St. Tammany and Washington parishes.

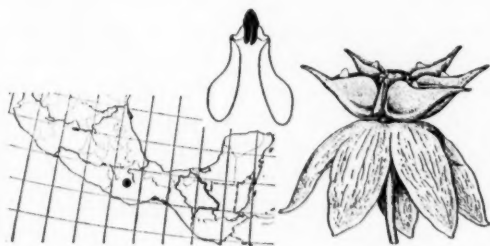
MISSISSIPPI: Harrison, Jackson, and Yalobusha counties.

SOUTH CAROLINA: Beaufort and Dorchester counties.

I have tried to include *A. michauxii* with the INCARNATAE because of the follicles erect on erect pedicels; but the structure of the gynostegium definitely allies it with the MACROTIDES, particularly with two geographically and environmentally distant species, *A. involucrata* and *A. macrosperma*, both of which also have approximately scattered leaves but with follicles erect on deflexed pedicels.

52. *ASCLEPIAS konzattii* Woodson, spec. nov.

Herbae perennes an suffrutices. Caules graciles subignosi altitudine ignoti aliquando compositi glabri vel juventate sparse minutissimeque pilosuli. Folia sat densa irregulariter approximata sessilia filiformia 8–13 cm. longa ca. 2 mm. lata revoluta glabra. Inflorescentiae e nodis superioribus subsessiles pauciflorae; pedunculis ca. 3–5 mm. longis subnullis; pedicellis gracilibus ca. 1.5 cm. longis glabris. Flores mediocres; calycis laciniis ovato-lanceolatis 4–5 mm. longis; corolla reflexe rotata colore pallido ignoto, lobis 7–8 mm. longis; gynostegium breviter stipitato, columna obconica ca. 1 mm. longa 2 mm. lata, cucullis late ovatis acuminatis conduplicatis ca. 6 mm. longis patulis marginibus exauriculatis cornu valde adnato falciforme cucullo multo brevior, androecio truncate conico ca. 2 mm. longo 3 mm. lato. Folliculi mihi ignoti.—Holotypus: C. Konzatti 4024 in Herb. N. Y. Bot. Gard. ("De Almoloyas a Tomellin, 800 metros. Distrito de Nochixtlán, Oaxaca, Mexico, Julio 14 de 1920.")

Fig. 58. *Asclepias konzattii* Woods.

The type specimen apparently does not include the entire stem, but from the several branches and the definite periderm I surmise the plant to have been suffruticose, at least. An extremely distinct species.

53. *ASCLEPIAS INVOLUCRATA* Engelm. ex Torrey, in Bot. Mex. Bound. Surv. 163, 1859. [T.: Wright 1690, MO!]

Low herbaceous perennials from woody subfusiform rootstalks. Stems clustered from the rootstalk, ascending or more or less decumbent, rather slender, branching repeatedly, 3–25 cm. long, minutely and generally puberulent. Leaves irregularly approximate, sessile or subsessile, narrowly lanceolate, apex very narrowly acuminate, base acute to obtuse, 1–12 cm. long, 3–10 mm. broad, firmly membranaceous and somewhat conduplicate, inconspicuously pilosulose particularly beneath. Inflorescences terminal and usually also from the few uppermost nodes, sessile, several- to few-flowered; pedicels 1.5–2.5 cm. long, minutely puberulent. Flowers rather small; calyx lobes ovate-lanceolate, 3–4 mm. long; corolla reflexed-rotate, pale green or pink, tinged purple without, the lobes 5–7 mm. long; gynostegium shortly stipitate, white with purplish keels, the column obconic, 1.0–1.5 mm. long and 1.5–2.5 mm. broad, the hoods ovate, acute, 3–4 mm. long, the horns adnate toward the base, falciform, incurved or ascending, about as long as the hood, the anther head truncate-conic, about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, stoutly fusiform, shortly apiculate, 4–7 cm. long, 1.5–2.0 cm. broad, very inconspicuously pilosulose to glabrate; seeds oval, 6–8 mm. long, the pale tawny coma 2–3 cm. long.

Dry gravelly hills, flats, chaparral, and arroyos. New Mexico and Arizona and adjacent Utah, Colorado, and Kansas; northern Mexico from Coahuila to Durango. Blooming from March to July.

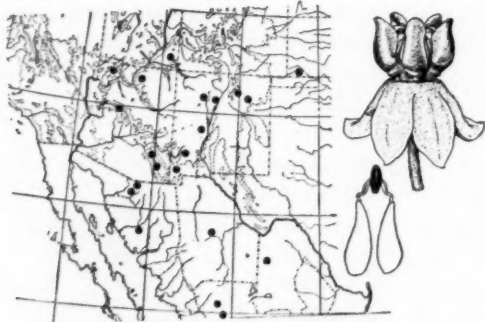


Fig. 59. *Asclepias involucrata* Engelm.

UNITED STATES:

ARIZONA: Cochise, Coconino, Graham, Mohave, and Yavapai counties.

COLORADO: Las Animas County.

KANSAS: Stevens County.

NEW MEXICO: Grant, Hidalgo, Mora, Sandoval, San Miguel, Santa Fe, and Socorro counties.

UTAH: San Juan County.

MEXICO: CHIHUAHUA: Chihuahua. COAHUILA: Piedras Negras. DURANGO: Santiago Papasquiaro, Tepehuanes. SONORA: Hermocillo, San Pedro, Nogales.

Fig. 60. *Asclepias macrosperma* Eastw.

54. *ASCLEPIAS MACROSPERMA* Eastw. in Bull. Torrey Bot. Club 25:172. 1898.
[Based on *A. involucrata* var. *tomentosa* Eastw.]

Asclepias involucrata var. *tomentosa* Eastw. in Zoe 4:120. 1893. [T.: Eastwood s. n., MO!]

Low herbaceous perennials from woody subfusiform rootstalks. Stems clustered from the rootstalk, ascending or more or less decumbent, rather stout, branching repeatedly, 4–17 cm. long, densely tomentulose. Leaves irregularly approximate, very shortly petiolate, broadly ovate to ovate-lanceolate, apex acute to obtuse, base broadly obtuse to rounded, 2–6 cm. long, 1–2 cm. broad, firmly membranaceous and somewhat crispate, densely tomentulose; petioles 1–7 mm. long. Inflorescences solitary and terminal, sessile, several- to many-flowered; pedicels rather slender, 1–2 cm. long, densely tomentulose. Flowers rather small; calyx lobes ovate, about 3 mm. long, minutely tomentulose; corolla reflexed-rotate, pale greenish more or less tinged with purple without, the lobes 5–6 mm. long; gynostegium very shortly stipitate, greenish white or cream, the column broadly obconic, about 0.7 mm. long and 1.3–1.5 mm. broad, the hoods broadly ovate, obtuse or rounded, 2.5–3.0 mm. long, the horn adnate toward the base, falciform, incurved, somewhat shorter than the hood, the anther head about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, broadly fusiform, shortly apiculate, 4–6 cm. long, 1.5–2.0 cm. broad, sparsely pilosulose to glabrate; seeds very broadly oval, 1.0–1.3 cm. long, the pale tawny coma 1.3–2.0 cm. long.

Sandy soil, along washes and arroyos. Southern Utah and northern Arizona. Blooming from May to June.

UNITED STATES:

ARIZONA: Apache and Coconino counties.

UTAH: Emery, Grand, San Juan, and Wayne counties.

This species is undeniably closely related to *A. involucrata* and might be considered as a subspecies of it. But both grow together in the range of *A. macrosperma*, and I have seen no intergrading individuals.

55. *ASCLEPIAS PUBERULA* A. Gray, in Proc. Amer. Acad. 16:104. 1881. [T.: Schaffner 60, GH.]

Small herbaceous perennials from thickened subfusiform rootstalks. Stems erect or more or less decumbent, simple or weakly branched from the base, 1.5–10.0 cm. long, very inconspicuously pilosulose. Leaves opposite, rather long-petiolate, ovate to narrowly lanceolate, apex acute to narrowly acuminate, base obtuse, 2–7 cm. long, 0.5–1.5 cm. broad, membranaceous, essentially glabrous; petioles 0.5–2.0 cm. long. Inflorescences terminal or lateral from few of the uppermost nodes, few- to several-flowered; peduncles 2–4 cm. long, slender; pedicels very slender, 1.0–1.5 cm. long. Flowers small; calyx lobes lanceolate, 2.5–3.0 mm. long; corolla reflexed-rotate, greenish white more or less suffused with purple without, the lobes about 5 mm. long; gynostegium subsessile, white or cream, the column very broadly obconic, about 0.5 mm. long and 1.5 mm. broad, the hoods broadly ovate, about

3 mm. long, the horn strongly adnate, minutely falciform, incurved, shorter than the hoods, the anther head broadly truncate-conic, about 1 mm. long and 2 mm. broad. Follicles unknown.

In wet or moist places, open meadows in fir forests. Hidalgo and San Luis Potosí. Blooming from June to September.

MEXICO: HIDALGO: Zerezo, Parque Nacional El Chico. SAN LUIS POTOSÍ: Morales.

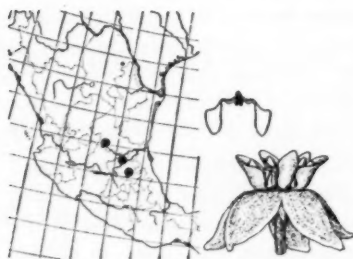
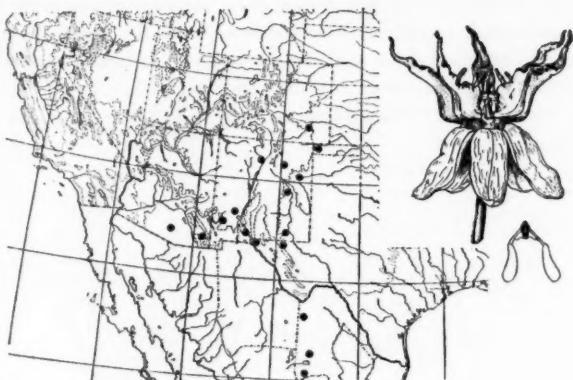


Fig. 61. *Asclepias puberula* A. Gray

56. *ASCLEPIAS MACROTIS* Torr. Bot. Mex. Bound. Surv. 164, t. 45. 1859. [T.: Wright 1691, MO!]

Suffrutescent perennials. Stems densely clustered from the rootstalk, repeatedly and rather fastigately branching, very slender and twiggy (rather resembling an *Ephedra*), 1–3 dm. tall, very inconspicuously puberulent in decurrent lines from the nodes, glabrate at maturity. Leaves opposite, sessile, filiform to acicular, 3.5–8.0 cm. long, 1–4 mm. broad, revolute, glabrous. Inflorescences solitary and lateral from the upper nodes, few- to several-flowered; peduncles slender, 2–10 mm. long; pedicels very slender, about 1 cm. long. Flowers rather small; calyx lobes ovate, 2–3 mm. long; corolla pale greenish yellow, slightly tinged with purple without, the lobes about 5 mm. long; gynostegium subsessile, cream or yellowish, the column about 0.5 mm. long and 2 mm. broad, ovate-lanceolate, the hoods very narrowly acuminate, 4–6 mm. long, the horn strongly adnate, much shorter than the hood, ascending, usually minutely pilosulose at the tip, the anther head truncately conic, about 1 mm. long and 2 mm. broad. Follicles erect on deflexed pedicels, very narrowly fusiform, long-apiculate, 4–7 cm. long, 5–7 mm. thick, smooth, inconspicuously pilosulose to glabrate; seeds oval, about 6 mm. long, white or pale tawny, 2.5–3.5 cm. long.

Fig. 62. *Asclepias macrotis* Torr.

Dry hills and mesas. New Mexico and adjacent Colorado, Oklahoma, Texas, and Arizona; northern Coahuila. Blooming from May to October.

UNITED STATES:

ARIZONA: Cochise and Pima counties.

COLORADO: Otero County.

NEW MEXICO: De Baca, Dona Ana, Eddy, Grant, Quay, San Miguel, Santa Fe, and Sierra counties.

OKLAHOMA: Cimarron County.

TEXAS: Culberson and El Paso counties.

MEXICO: COAHUILA: Múzquiz, G. Cepeda, Picacho de San José, Picacho del Fuste, Sierra de Parras.

An extremely well-marked and constant species, with floral structure quite *sui generis*, particularly the odd horns.

57. *ASCLEPIAS LEMMONI* A. Gray, in Proc. Amer. Acad. 19:85. 1883. [T.: *Lemmon s. n.*, MO!]

Asclepias chapalensis Brandg. in Univ. Calif. Publ. Bot. 6:358. 1916. [T.: *Lemmon s. n.*, MO!]

Herbaceous perennials, conspicuously and generally setose-pilose throughout. Stems very stout, simple, 6–8 dm. tall. Leaves opposite, sessile, very broadly and regularly oval, apex broadly rounded, base broadly cordate and amplexicaul, 16–22 cm. long, 9–11 cm. broad, firmly membranaceous. Inflorescences subterminal from few to several of the uppermost nodes, many-flowered; peduncles 6–14 cm. long, rather stout; pedicels more slender, 2–3 cm. long. Flowers large; calyx lobes lanceolate, 5–7 mm. long; corolla pale greenish yellow slightly suffused with purple without, the lobes 1.0–1.3 cm. long; gynostegium shortly stipitate, cream, the column stoutly obconic, about 2 mm. long and 3 mm. broad, the hoods ovate,

narrowly acute, widely spreading, 8–9 mm. long, the horn adnate to the base, rather stout and compressed, ascending, much shorter than the hood, the anther head broadly truncate-conic, about 3 mm. long and 4.5 mm. broad. Follicles erect on deflexed pedicels, rather narrowly fusiform and shortly apiculate, 7–12 cm. long, 1.5–2.5 cm. broad, densely setose-pilose; seeds oval, 6–7 mm. long, the pale tawny coma 2–3 cm. long.

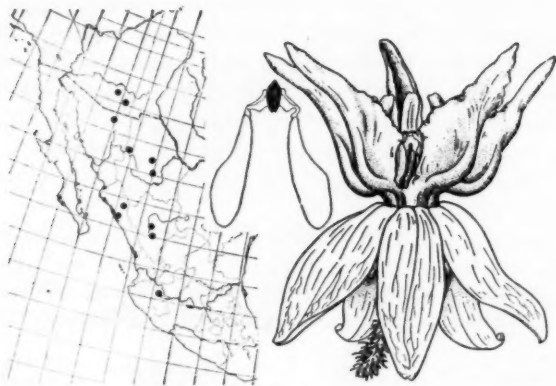


Fig. 63. *Asclepias lemmoni* A. Gray

Rocky limestone slopes and canyons in oak and pine woods. Southern Arizona; Chihuahua to Sonora and southward to Jalisco. Blooming from June to September.

UNITED STATES:

ARIZONA: Cochise and Pima counties.

MEXICO: CHIHUAHUA: Temosachic, Majalca, Mapula Mtns. DURANGO: Durango, El Salto. JALISCO: Lake Chapala. SINALOA: Culiacán, Cerro Colorado. SONORA: San José Mtns.

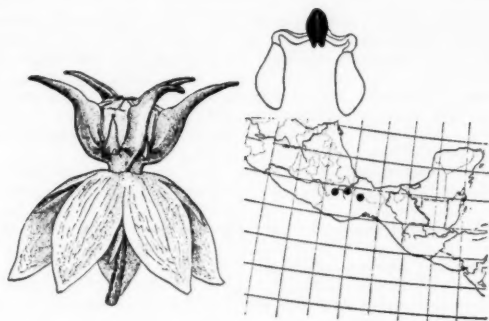
An unusually distinct and constant species, superficially resembling *A. speciosa*. It is an odd coincidence that Lemmon collected the type specimens of both *A. lemmoni* and *A. chapalensis*, the former in Arizona in 1881 and the latter in Jalisco in 1905.

58. *ASCLEPIAS LAXIFLORA* (Benth.) Dcne. in DC. Prodr. 8:571. 1844.

Otaria laxiflora Benth. Pl. Hartw. 67. 1839. [T.: Hartweg s. n., K!]

Asclepias melantha Dcne. in DC. Prodr. 8:570. 1844. [T.: Andrieux 233, P!]

Herbaceous perennials. Stems rather slender, simple, 6–8 dm. tall, minutely puberulent to glabrate in age. Leaves opposite, shortly petiolate, broadly ovate to ovate-lanceolate, apex shortly acute or acuminate, base broadly obtuse to rounded, 6–9 cm. long, 3–4 cm. broad, firmly membranaceous, dark green above, glaucous

Fig. 64. *Asclepias laxiflora* (Benth.) Dcne.

beneath, inconspicuously puberulent below to glabrate above; petioles 0.5–1.5 cm. long. Inflorescences subterminal from few of the uppermost nodes, few- to several-flowered; peduncles slender, 1–4 cm. long; pedicels slender, about 2 cm. long. Flowers large, showy; calyx lobes ovate-lanceolate, about 4 mm. long, deep purple; corolla reflexed-rotate, deep reddish purple, the lobes 1.0–1.2 cm. long; gynostegium shortly stipitate, deep reddish purple, the column broadly obconic, about 1 mm. long and 2.5 mm. broad, the hoods linear-lanceolate, long-acuminate, spreading, about 8 mm. long, the horn linguiform, about half adnate, incurved, much shorter than the hoods, the anther head truncately conic, about 2.5 mm. long and 3.5 mm. broad. Follicles unknown.

Mountain-sides. Oaxaca. Blooming from May to August.

MEXICO: OAXACA: La Parada, Cerro de Metate, Cerro de San Felipe.

A very showy species superficially resembling *A. hypoleuca* of the north, from which it differs in the nearly glabrous leaves and narrower keeled hoods with very broad marginal lobing and linguiform horns.

Series 8. ROSEAE*

KEY TO THE SPECIES

- a. Stems typically stout and erect; flowers yellowish, rarely somewhat suffused with purple; anther head about three-quarters as long as broad, the wings corneous and acute or spurred at the base.
- b. Plants herbaceous, the leaves broadly laminate and persistent.
- c. Inflorescences sessile or subsessile, the peduncles shorter than the subtending petioles or scarcely longer.
- d. Hoods about as long as the anther head, much shorter than the corolla lobes.
- e. Leaves variable, relatively small, typically rather oblong and two to three times as long as broad; plants densely puberulent. Coastal Plain: North Carolina to Florida; eastern Texas59. *A. tomentosa*
- ee. Leaves rather uniform, relatively large, typically almost as broad as long.

* See also species 31, *Asclepias glaucescens* HBK., and 98, *Asclepias elata* Benth.

- f. Leaves subquadrate, definitely petiolate; plants persistently puberulent generally; hoods broadly 2-lobed at the tip, the horn not wholly adnate. South Dakota to Texas and westward to Colorado and New Mexico; northern Chihuahua60. *A. arenaria*
- ff. Leaves very broadly oval to obovate, subsessile; plants minutely tomentulose when very young, soon becoming glabrate; hoods entire, the horn wholly adnate. Southwestern Nebraska to western Texas and westward to southern Utah and California61. *A. latifolia*
- dd. Hoods about twice as long as the anther head, about equalling the corolla lobes; plants densely puberulent generally. Coastal Plain: South Carolina to eastern Texas62. *A. obovata*
- cc. Inflorescences obviously pedunculate, the peduncles much longer than the subtending petioles.
- d. Horns about half adnate to the hoods.
- c. Plants essentially glabrous; leaves narrowly lanceolate, cuneate, rather irregularly approximate; flowers rather few and lax; follicles pendulous or subpendulous. Eastern Utah63. *A. labriformis*
- cc. Plants minutely tomentulose when young, soon becoming glabrate; leaves ovate and deeply cordate, minutely erose, opposite; flowers rather many and crowded; follicles erect on deflexed pedicels. Southern California and adjacent Arizona, Nevada, and Utah; Baja California64. *A. erosa*
- dd. Horns wholly adnate to the hoods; plants densely and persistently puberulent or tomentulose, cordate, entire, opposite or irregularly approximate; flowers rather many and crowded; follicles erect on deflexed pedicels. California; Baja California65. *A. eriocarpa*
- bb. Plants fruticose or suffruticose, the leaves filiform, caducous.
- c. Hoods about equalling the anther head, scarcely saccate at the base.
- d. Hoods erect, the horn conspicuously exerted and arching over the anther head, without a posterior crest. Southwestern Baja California66. *A. masonii*
- dd. Hoods spreading, the horn barely exerted and abruptly inflexed toward the anther head, with a broad posterior crest. Coastal Sinaloa67. *A. subaphylla*
- cc. Hoods appearing much shorter than the anther head, conspicuously saccate at the base. Extreme southern California and adjacent Arizona; Baja California68. *A. albicans*
22. Stems typically rather slender, frequently subscapose, clustered from the base and more or less decumbent; flowers red to pinkish, rarely white; anther head about half as long as broad, the wings pergamentaceous and broadly rounded at the base.
- b. Plants relatively stout, more or less densely arachnoid-tomentose to glabrate generally, the stems 2-7 dm. long; inflorescences sessile or subsessile even when terminal. Southern to central California69. *A. vestita*
- bb. Plants relatively slender and frequently subscapose, cinereous-tomentulose to glabrate generally, the stems usually 4-15 cm. long; inflorescences long-pedunculate.
- c. Leaves broadly ovate to suborbicular; follicles broadly fusiform. Southwestern Texas and southern New Mexico and Arizona; Chihuahua to Sonora and southward to Durango and San Luis Potosí70. *A. nummularia*
- cc. Leaves linear to filiform; follicles narrowly fusiform. Jalisco to Chiapas; Guatemala71. *A. rosea*

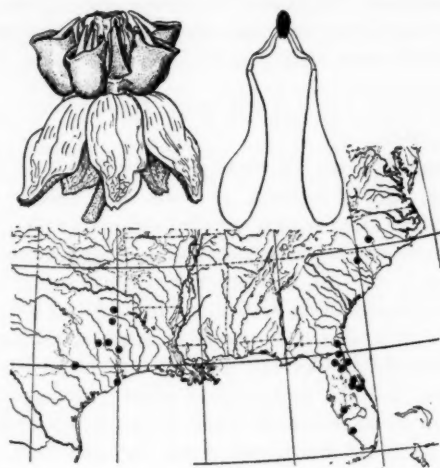
This series quite possibly is polyphyletic, representing more or less parallel extremes derived from SYRIACAE, PURPURASCENTES, and MACROTIDES. The tendency toward saccate hoods and complete fusion of the horn may show transition to the subgenus SOLANOA; in fact *A. albicans* might almost as well be referred there.

59. *ASCLEPIAS TOMENTOSA* Ell. Sketch Bot. S. Car. & Ga. 1:320. 1821, ex char.

Asclepias megalotis Raf. New Fl. North Amer. 4:61. 1838, ex char.

Asclepias aceratoides M. A. Curtis, in Amer. Jour. Sci. Ser. II, 7:407. 1849, ex char.

Herbaceous perennials. Stems rather stout, simple or branching rather infrequently, 2-7 dm. tall, softly and rather inconspicuously appressed-puberulent. Leaves opposite, petiolate, variable in outline and size, typically rather oblong or oval to oblong-lanceolate or obovate, apex usually obtuse, to acute or rounded and

Fig. 65. *Asclepias tomentosa* Ell.

somewhat retuse, base broadly acute to rounded, 4–9 cm. long, 1.5–5.0 cm. broad, firmly membranaceous, dark green above, pale beneath, softly and generally puberulent particularly below; petioles about 1 cm. long. Inflorescences lateral and solitary at several or numerous of the upper nodes, sessile or subsessile, several- to many-flowered; pedicels 1.5–2.0 cm. long, softly puberulent. Flowers rather large; calyx lobes lanceolate, 3–6 mm. long; corolla pale yellowish green somewhat flushed with orange without, the lobes 9–10 mm. long; gynostegium yellowish cream, very shortly stipitate, the column obconic, about 1.5 mm. long and 3 mm. broad, the hoods obovate-subquadrate, truncate, about 4 mm. long, the horn wholly adnate, falciform, sharply incurved, longer than the hood, the anther head truncately conic, about 3.5–4.0 mm. long and 5–6 mm. broad. Follicles erect on deflexed pedicels, narrowly fusiform, 10–12 cm. long, about 1 cm. broad, smooth, softly puberulent to glabrate; seeds broadly oval, about 1 cm. long, the pale tawny coma about 4.5 cm. long.

Sandy soil; pine barrens. North Carolina to Florida; eastern Texas. Blooming from May to June.

UNITED STATES:

FLORIDA: Brevard, Collier, De Soto, Duval, Lake, Marion, Orange, Osceola, Putnam, and Volusia counties.

NORTH CAROLINA: Harnett County.

SOUTH CAROLINA: Darlington County.

TEXAS: Polk County.

This is the only species east of the Mississippi River with the very strongly adnate horns so typical of numerous western and Mexican species. Because of its

very limited distribution in Florida and the adjacent coastal plain, I am inclined to view it as a relatively ancient species and consequently this particular type of hood as having been evolved rather early.

60. *ASCLEPIAS ARENARIA* Torr. in Bot. Mex. Bound. Surv. 162. 1859. [T.: *Wislizenus* s. n., MO!]

Herbaceous perennials. Stems relatively stout, simple or branching infrequently, densely tomentulose. Leaves opposite, petiolate, very broadly obovate-oval and more or less subquadrate, apex broadly rounded and more or less retuse, base truncate or broadly rounded and occasionally somewhat cordate, rather uniform in shape and size, 6–9 cm. long, 4–8 cm. broad, firmly membranaceous, concolorous, more or less generally white-tomentulose particularly beneath; petioles 0.5–1.3 cm. long. Inflorescences lateral and solitary at several to many of the upper nodes, rather many-flowered; peduncles obsolete to about 2 cm. long, densely tomentulose; pedicels rather stout, 1–2 cm. long, densely white-tomentulose. Flowers rather large; calyx lobes ovate-lanceolate, 6–7 mm. long, densely and minutely white-tomentulose; corolla reflexed-rotate, pale green, the lobes 9–10 mm. long; gynostegium shortly stipitate, white or cream, the column obconic, about 2 mm. long and 3.5 mm. broad, the hoods more or less broadly 2-lobed at the tip, subquadrate,

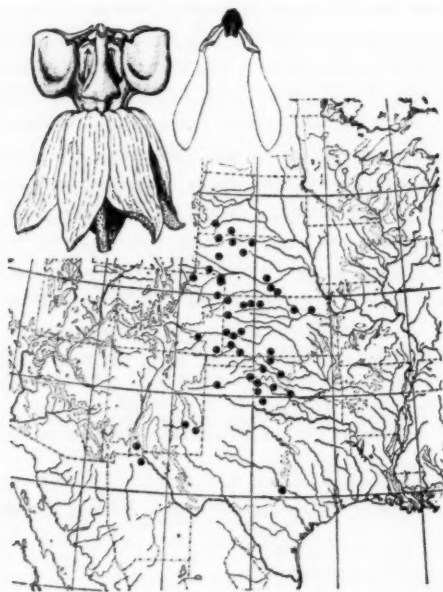


Fig. 66. *Asclepias arenaria* Torr.

the horn about half adnate, rather narrowly falciform, sharply incurved, somewhat longer than the hood, the anther head truncately conic, about 3 mm. long and 4 mm. broad. Follicles erect on deflexed pedicels, rather broadly fusiform and shortly apiculate, 7-9 cm. long, 1.5-2.5 cm. broad, finely tomentulose to glabrate; seeds broadly oval, about 11 mm. long, the pale tawny coma about 2.5 cm. long.

Sandy soil, spreading to roadsides. South Dakota to Texas and westward to Colorado and New Mexico; Chihuahua. Blooming from May to August.

UNITED STATES:

COLORADO: Baca, Otero, Phillips, Sedgwick, Weld, and Yuma counties.

KANSAS: Barber, Cheyenne, Finney, Graham, Grant, Hamilton, Kearney, Riley, Rooks, Seward, Shawnee, Sheridan, and Wallace counties.

NEBRASKA: Brown, Buffalo, Cherry, Cheyenne, Franklin, Garden, Kearney, Sheridan, and Thomas counties.

NEW MEXICO: Chaves, Dona Ana, and Roosevelt counties.

OKLAHOMA: Beckham, Cleveland, Grady, Greer, Kingfisher, Roger Mills, Woodward, and Woods counties.

SOUTH DAKOTA: Bennett and Washington counties.

TEXAS: Bastrop, Hemphill, and Potter counties.

MEXICO: CHIHUAHUA: Paso del Norte, Samalayuca.

The characteristic broad 4 lobes of the corona hoods apparently consist of two marginal auricles, with the median lobe broadly retuse, as in the leaves.

Torrey does not cite a collector of the type specimen, but in the herbarium of the Missouri Botanical Garden is an excellent specimen collected on the Jornada del Muerte in 1846 by Wislizenus on his perilous and eventful buggy trip into the midst of the Mexican war. I feel that this probably represents the type of the species.

61. *ASCLEPIAS LATIFOLIA* Raf. Atl. Jour. 146. 1832. [Based on *Asclepias obtusifolia* β *latifolia* Torr.]

Asclepias obtusifolia β ? *latifolia* Torr. in Ann. Lyc. Nat. Hist. N. Y. 2:217. 1828.

Otanema latifolia (Raf.) Raf. New Fl. North Amer. 4:61. 1838.

Asclepias jamesii Torr. Bot. Mex. Bound. Surv. 162. 1859. [Based on *Asclepias obtusifolia* β ? *latifolia* Torr.]

Herbaceous perennials. Stems stout, simple or infrequently branching, 2-6 dm. tall, minutely tomentulose when very young, soon becoming glabrate. Leaves opposite, very shortly petiolate, very broadly oval-obovate, apex broadly rounded and frequently somewhat retuse, base very broadly rounded and frequently somewhat cordate, 4-16 cm. long, 4-13 cm. broad, firmly membranaceous and somewhat coriaceous, concolorous and somewhat glaucous, minutely white-tomentulose generally when very young, soon glabrate; petioles about 5 mm. long. Inflorescences lateral at several to numerous of the upper nodes, subsessile or very shortly pedunculate, many-flowered; peduncles obsolete to 1.5 cm. long; pedicels rather slender, 2.5-3.0 cm. long, minutely white-tomentulose. Flowers rather large; calyx lobes ovate-lanceolate, about 4 mm. long; corolla reflexed-rotate, pale green sometimes tinted purplish without, the lobes 11-12 mm. long; gynostegium shortly stipitate,

greenish white, the column broadly obconic, about 2 mm. long and 3 mm. broad, the hoods subquadrate, truncate or broadly retuse, about 4 mm. long, the horn wholly adnate, very broadly falciform, sharply incurved, somewhat longer than the hood, the anther head about 3 mm. long and 4 mm. broad, truncately conic. Follicles erect on deflexed pedicels, broadly fusiform, shortly apiculate, 6-8 cm. long, 1.5-3.0 cm. broad, smooth, essentially glabrous; seeds oval, about 7 mm. long, the pale tawny coma about 2 cm. long.

Mixed prairies, badlands, and high plains, spreading to roadsides and railways. Southwestern Nebraska and western Texas westward to southern Utah and southeastern California. Blooming from May to September.

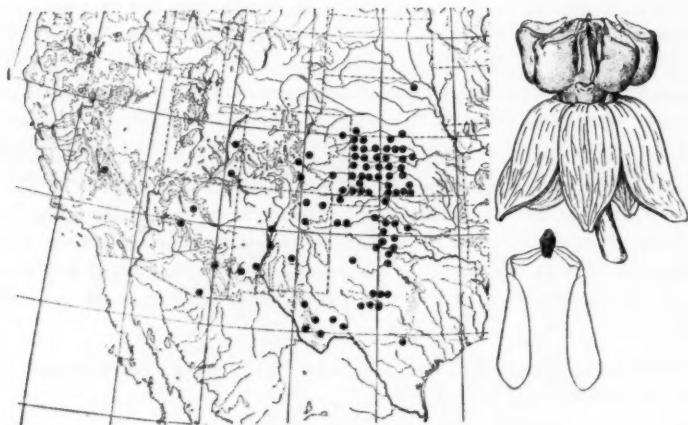


Fig. 67. *Asclepias latifolia* Raf.

UNITED STATES:

ARIZONA: Coconino, Graham, Santa Cruz, and Yavapai counties.

CALIFORNIA: Inyo County.

COLORADO: Baca, Bent, El Paso, Fremont, Huerfano, and Yuma counties.

KANSAS: Barber, Barton, Cheyenne, Clark, Comanche, Ellis, Finney, Gove, Graham, Grant, Greely, Hamilton, Harper, Haskell, Hodgeman, Kearney, Kingman, Kiowa, Lane, Lincoln, Logan, Meade, Morton, Ness, Osborne, Pawnee, Phillips, Rawlins, Rooks, Rush, Russell, Scott, Seward, Selkirk, Sheridan, Sherman, Stafford, Stanton, Stevens, Thomas, Trego, Wallace, and Wichita counties.

NEBRASKA: Dundy, Franklin, and Knox counties.

NEW MEXICO: Bernalillo, Colfax, Grant, Lincoln, San Miguel, Sierra, Socorro, and Union counties.

OKLAHOMA: Beckham, Canadian, Cimarron, Custer, Harmon, Harper, Kiowa, Roger Mills, and Tillman counties.

TEXAS: Baylor, Bexar, Brewster, Callahan, Childress, Concho, Culberson, Hemphill, Irion, Jeff Davis, Lubbock, Nolan, Oldham, Pecos, Presidio, Terrell, Tom Green, and Willbarger counties.

UTAH: Grand and San Juan counties.

Somewhat resembling *A. arenaria* except for its glabry, but with very different hoods. I have seen no intergrading specimens. Both species are extremely distinct and uniform.

62. *ASCLEPIAS OBOVATA* Ell. Sketch Bot. S. Car. & Ga. 321. 1821, ex char.
[T.: Jackson s. n.]

Asclepias viridiflora γ *obovata* (Ell.) Torr. Fl. North & Mid. U. S. 1:284. 1824.

Acerates obovata (Ell.) Eaton, Man. ed. 6, 3. 1833.

Polyotus obovatus (Ell.) Nutt. in Trans. Amer. Phil. Soc. N. S. 5:201. 1837.

Herbaceous perennials from a rather deep slender rootstalk. Stems rather stout, simple or branching infrequently, 1.5–5.0 dm. tall, softly tomentulose. Leaves opposite, shortly petiolate, quite variable in size and outline, the lowermost usually broadly oval or oblong, becoming narrower and smaller above, apex broadly acute to rounded, base obtuse to rounded or truncate, 3–8 cm. long, 1–3 cm. broad, firmly membranaceous, densely tomentulose particularly beneath; petioles 0.5–1.0 cm. long. Inflorescences terminal, solitary or also lateral from the uppermost few nodes, several- to rather many-flowered, subsessile to very shortly pedunculate, densely tomentulose; peduncles obsolete to about 5 mm. long; pedicels rather stout, 8–10 mm. long. Flowers rather large; calyx lobes ovate-lanceolate, 4–5 mm. long, pilosulose; corolla reflexed-rotate, pale greenish yellow, the lobes 9–10 mm. long;

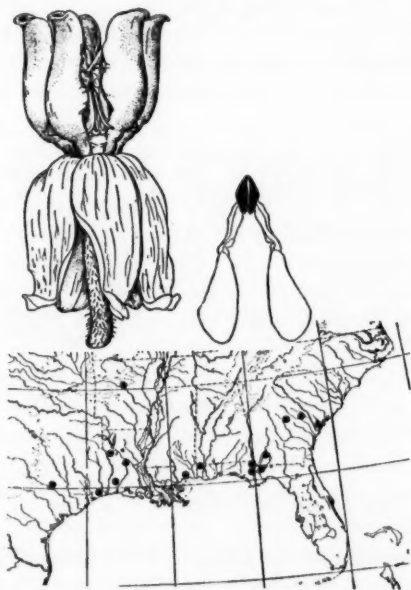


Fig. 68. *Asclepias obovata* Ell.

gynostegium shortly stipitate, pale greenish orange, the column obconic, about 1.5 mm. long and 2 mm. broad, the hoods broadly oblong-oval, rounded, about 6 mm. long, the horn basally adnate, rather narrowly falciform, sharply incurved, about as long as the hoods, the anther head truncately conic, about 3 mm. long and 4 mm. broad. Follicles erect on deflexed pedicels, tomentose when young, unknown when mature.

Sandy oak and pine woods, spreading to fields and roadsides. South Carolina to Florida and westward to eastern Texas. Blooming from June to August.

UNITED STATES:

ALABAMA: Mobile County.

FLORIDA: Calhoun, Gadsden, and Jackson counties.

GEORGIA: Jenkins, Laurens, and Mitchell counties.

LOUISIANA: Calcasieu, Natchitoches, and Rapides parishes.

MISSISSIPPI: Harrison County.

SOUTH CAROLINA: Beaufort County.

TEXAS: Austin, Bastrop, Houston, Jefferson, Leon, and Polk counties.

It is unfortunate that Elliott's type is not still preserved at the Charleston Museum. Elliott compares his species to *A. viridiflora* and states that his specimen had been so injured that he could not determine the presence or absence of a horn. Taking this cue, some botanists have considered *A. obovata* to be merely the broad-leaved phase of *A. viridiflora* or at best a related species. Elliott's description of the "leaves of the crown twice as long as the corpuscle [i.e. anther head]" at once removes that possibility and assures the present, and traditional, interpretation.

The species is a very odd one, somewhat reminiscent of *A. meadii*, but definitely seems more naturally related to *A. tomentosa*, although with much longer hoods.

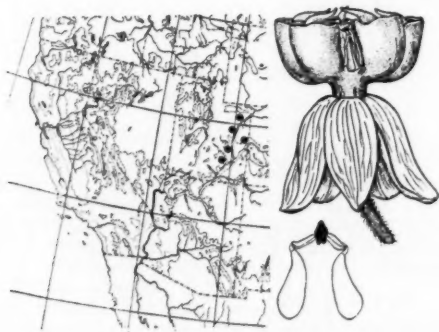


Fig. 69. *Asclepias labriformis* M. E. Jones

63. *ASCLEPIAS LABRIFORMIS* M. E. Jones, in Proc. Calif. Acad. Ser. II, 5:708. 1895. [T.: M. E. Jones 5650, MO!]

Herbaceous perennials. Stems rather slender, simple or branching infrequently, 2-5 dm. tall, very inconspicuously puberulent when very young, soon becoming

glabrate. Leaves irregularly approximate, subsessile, lanceolate to linear-lanceolate above, apex acute to acuminate, base acutely cuneate, 5–15 cm. long, 0.6–2.5 cm. broad, firmly membranaceous or somewhat subsucculent, pale green, essentially glabrous. Inflorescences lateral and solitary at several of the upper nodes, definitely pedunculate, few- to several-flowered; peduncles somewhat stout, 0.4–3.0 cm. long; pedicels slender, 1.5–2.0 cm. long. Flowers mediocre; calyx lobes lanceolate, 4–5 mm. long; corolla pale yellowish green, the lobes about 8 mm. long; gynostegium shortly stipitate, cream, the column rather narrowly cylindrical, about 1.5 mm. long and 2 mm. broad, the hoods subquadrate, truncate, about 3–4 mm. long, the horn about half adnate, rather narrowly falciform, incurved, somewhat longer than the hood, the anther head truncately conic, about 1.5 mm. long and 2 mm. broad. Follicles on deflexed or pendulous peduncles, ovoid to very broadly fusiform, very shortly apiculate, 4–7 cm. long, 1.5–3.0 cm. broad, smooth, glabrous; seeds very broadly oval, 1–2 cm. long, the pale tawny coma 1.5–1.7 cm. long.

Washes, sandstone canyons, dry cliffs, and high flats. Eastern Utah. Blooming from May to August.

UNITED STATES:

UTAH: Carbon, Emery, Grand, Uintah, and Wayne counties.

Although very easily recognized, *A. labriformis* is rather difficult to place with natural affinities. I am placing it in series ROSEAE even though the horns are not strongly adnate and the column is a bit too narrow.

64. ASCLEPIAS EROSA Torr. Bot. Mex. Bound. Surv. 162. 1859. [T.: *Thurber s. n.*, US!]

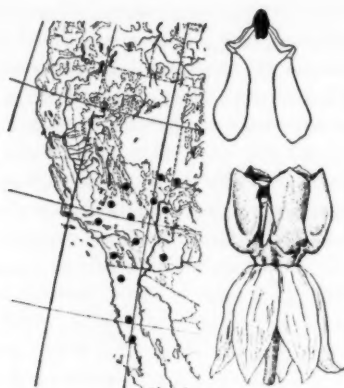
Asclepias leucophylla Engelm. in Parry, in Amer. Nat. 9:348. 1875. [T.: Parry 207, MO!]

Asclepias demissa Greene, Leaf. Bot. Obs. & Crit. 2:231. 1912. [T.: Loew s. n., US!]

Asclepias obtusata Greene, loc. cit. 232. 1912. [T.: Rothrock s. n., US!]

Asclepias rothrockii Greene, loc. cit. 1912. [T.: Rothrock s. n., US!]

Massive herbaceous perennials, more or less woody at the base. Stems very stout, simple or branching infrequently, 1–2 m. tall, minutely tomentulose when young, soon glabrate. Leaves opposite, sessile, broadly ovate, occasionally broadly oblong-elliptic, apex rather shortly acuminate, base broadly cordate and amplexicaul or the uppermost rounded or subtruncate, 6–24 cm. long, 2.5–11.0 cm. broad, firmly membranaceous or somewhat subcoriaceous or subsucculent, the margins minutely erose, conspicuously white arachnoid-tomentulose when young, becoming glabrate, pale green. Inflorescences solitary or rarely paired at few to several of the uppermost nodes, usually very many-flowered, definitely pedunculate; peduncles 2–12 cm. long, white-tomentulose; pedicels rather slender, 1.2–3.5 cm. long, very densely white-tomentulose. Flowers rather large; calyx lobes lanceolate, 4–6 mm. long, densely white-tomentulose; corolla pale yellowish green, the lobes 9–10 mm. long; gynostegium shortly stipitate, greenish white or cream, the column obconic, about 2 mm. long and 3 mm. broad, the hoods very broadly oval, broadly obtuse at the tip, about 4 mm. long, the horn rather strongly adnate, falciform, incurved, about

Fig. 70. *Asclepias erosa* Torr.

as long as the hood, the anther head truncately conic, about 3 mm. long and 4 mm. broad. Follicles erect on deflexed pedicels, broadly fusiform, rather shortly apiculate, 5–7 cm. long, 2–3 cm. broad, smooth, glabrous; seeds very broadly oval, about 1.3 cm. long, the pale tawny coma about 1.5 cm. long.

Gulches, washes, and canyons, Mohave and Colorado deserts. Southern California and adjacent Utah, Nevada, and Arizona; Baja California. Blooming from April to October.

UNITED STATES:

ARIZONA: Mohave and Yuma counties.

CALIFORNIA: Inyo, Kern, Los Angeles, Riverside, San Bernardino, and San Diego counties.

NEVADA: Clark and Lincoln counties.

UTAH: Washington County.

MEXICO: BAJA CALIFORNIA: Mission de San Pedro, Vallejo Mtns., Agua Dulce, San Felipe.

One of the largest American milkweeds, the habit somewhat recalling *Calotropis procera* of the Old World.

65. *ASCLEPIAS ERIOCARPA* Benth. Pl. Hartw. 323. 1849. [T.: Hartweg 127, K!]

Asclepias fremontii Torr. Rept. Pacif. R. R. Surv. 6:87. 1857. [T.: Bigelow s. n., US!]

Asclepias kototo Eastw. in Zoe 5:86. 1900. [T.: Hudson s. n., CAS!]

Asclepias eriocarpa var. *microcarpa* Munz & Johnston, in Bull. Torrey Bot. Club 49:355. 1923. [T.: Johnston 2833, CAS!]

Herbaceous perennials. Stems rather stout, simple or branching infrequently, 4–10 dm. tall, densely white-tomentulose above, becoming glabrate below. Leaves opposite to irregularly approximate, shortly petiolate, oblong to oval, apex shortly acuminate to obtuse, base obtuse to rounded or subtruncate, frequently shallowly cordate, 8–20 cm. long, 3–8 cm. broad, firmly membranaceous, white-tomentulose particularly above, at length becoming glabrate; petioles 0.5–1.0 cm. long. In-

florescences lateral from few to several of the uppermost nodes, obviously pedunculate; peduncles 1–10 cm. long, rather stout, white-tomentulose; pedicels slender, 2–5 cm. long, very densely white-tomentulose. Flowers moderately large; calyx lobes ovate-lanceolate, 4–5 mm. long, minutely tomentulose; corolla reflexed-rotate, greenish or yellowish cream sometimes flushed with rose without, the lobes 7–9 mm. long; gynostegium shortly stipitate, cream frequently tinged with rose, the column about 1 mm. long and 2 mm. broad, the hoods very broadly oval, 3–4 mm. long, the horn wholly adnate, very broadly falciform, sharply incurved, somewhat longer than the hood, the anther head truncately conic, about 3 mm. long and 4 mm. broad. Follicles erect on deflexed pedicels, broadly fusiform, shortly apiculate, 5–9 cm. long, 2–3 cm. broad, smooth, densely white-tomentulose; seeds broadly oval, 8–9 mm. long, the tawny coma 1.5–3.0 cm. long.



Fig. 71. *Asclepias eriocarpa* Benth.

Adobe flats, rocky barrens, open woods, fields, stream banks, spreading to roadsides. California; Baja California. Blooming from May to October.

UNITED STATES:

CALIFORNIA: Butte, Fresno, Glenn, Kern, Lake, Lassen, Los Angeles, Mendocino, Monterey, Nevada, Orange, Riverside, San Benito, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Shasta, and Tehama counties.

MEXICO: BAJA CALIFORNIA: Sierra San Pedro Martir, Sierra Juarez.

The leaves of *A. eriocarpa* are predominantly opposite, but the nodes are frequently more or less displaced and whorls of three or four are occasional.

66. *ASCLEPIAS masonii* Woodson, spec. nov.

Suffrutices subaphylli glaucescentes altitudine ignoti. Caules graciles albescentes glabri aliquando compositi post aetatem florentem aphylli. Folia opposita sessilia linearia vel filiformia ca. 2–5 cm. longa ca. 1 mm. lata mox caduca. Inflorescentiae e nodis superioribus laterales breviuscule pedunculatae pluriflorae; pedunculis 1–3 cm. longis minute pilosulis; pedicellis gracillimis ca. 1.5 cm. longis pilosulis. Flores majusculi; calycis laciniis ovato-lanceolatis ca. 3 mm. longis minute puberulis;

corolla dilute gilva, lobis 7–8 mm. longis; gynostegio breviter stipitato lacteo, columna obconica ca. 1.5 mm. longa 2.5 mm. lata, cucullis erectis ovalibus 7–8 mm. longis, cornu valde adnato simplice et late falciformi valde exserto cucullum superante, androecio truncate conico ca. 2.5 mm. longo et 4.5 mm. lato. Folliculi in pedunculo pendulo anguste fusiformes anguste apiculati 10–13 cm. longi ca. 1.5 cm. lati inermes juventate minute pilosuli mox glabri; seminibus ovalibus ca. 5 mm. longis, coma pallide fulva ca. 2.5 mm. longa.—Holotypus: *J. N. Rose 16305* in Herb. U. S. Nat. Mus. (Santa Margarita Isl., Baja California, Mexico, March 20, 1911).

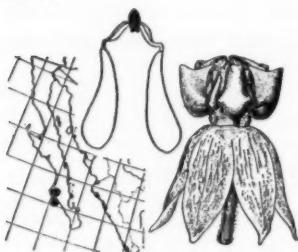


Fig. 72. *Asclepias masonii* Woods.

masonii is restricted to a very limited area around Magdalena Bay and its off-shore islands, at the southern extremity of *A. albicans* but still within its borders. Much the same situation obtains with regard to *A. subaphylla* which also is very closely related, and restricted to a rather narrow area on the eastern shore of the Gulf of California.

The general situation of these three populations is rather similar to that of the subspecies of *A. cryptoceras* and *A. californica*, where, however, the populations are isolated geographically and when not so isolated (viz. *A. cryptoceras* in eastern California) tend to merge. At least in the case of *A. albicans* and *A. masonii*, on the other hand, geographic barriers apparently do not exist and still the populations seem to maintain their integrity, as I judge from the several collections before me.

67. *ASCLEPIAS subaphylla* Woodson, spec. nov.

Frutices vel suffrutices ca. 2–4 m. alti. Caules graciles albescentes juventate minutissime puberuli tandem glabrati aliquando compositi post aetatem florentem aphylli. Folia opposita sessilia linearia 5–8 cm. longa 1–2 mm. lata mox caduca. Inflorescentiae e nodis superioribus laterales brevissime pedunculatae pluriflorae; pedunculis ca. 1.0–1.5 cm. longis minute puberulis; pedicellis gracilibus ca. 1.5 cm. longis. Flores mediocres; calycis laciniis ovato-lanceolatis ca. 3 mm. longis; corolla gilva, lobis ca. 7 mm. longis; gynostegio breve stipitato gilvo vel lacteo, columna latissime obconico ca. 1 mm. longo 2 mm. lato, cucullis obovatis emarginatis patulis ca. 3.5 mm. longis, cornu valde adnato latissime falciformi crista posteriore munito inflexo cucullos superante, androecio late truncateque conico ca.

2 mm. longo 3 mm. lato. Folliculi vel erecti vel subpendentes pedunculis vel erectis vel patulis anguste fusiformes longe apiculati 8–12 cm. longi 1.0–1.5 cm. crassi minutissime puberuli mox glabrescentes; seminibus ovalibus ca. 5 mm. longis, coma pallide lutea ca. 2 cm. longa.—Holotypus: *J. N. Rose, Paul C. Standley & P. G. Russell 14817* in Herb. U. S. Nat. Mus. (Sand dunes, in the vicinity of Altata, Sinaloa, Mexico, April 18, 1910).

Sand dunes and shaded rocky places, Coastal Sinaloa. Blooming from February to September.

MEXICO: SINALOA: Altata, Pueblo del Limón, San Ignacio.

This species, like the preceding (*A. masonii*), is very closely related to *A. albicans*. The leaves of *A. subaphylla* appear to be larger and maintained longer upon the stems than in either of the two other species. Narvaez Montes and Salazar (sub no. 139 in U. S. Nat. Herb.) report that the species is known as *candelilla bronca*, and that the milk is used in villages as a purgative, "the dose a single drop." I cannot decide from the several specimens before me whether the follicles are pendulous or erect; the peduncles appear as erect or ascending.

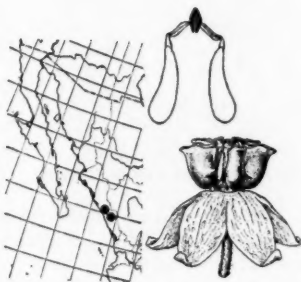
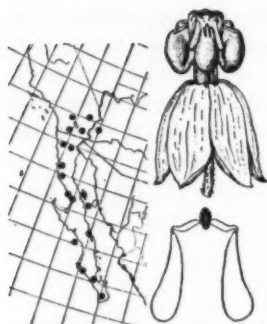


Fig. 73. *Asclepias subaphylla* Woods.

68. *ASCLEPIAS ALBICANS* S. Wats. in Proc. Amer. Acad. 24:59. 1889. [T.: *E. Palmer 588*, GH!]

Twiggy shrubs. Stems rather slender, simple or repeatedly branching, 1–3 m. tall, heavily glaucous and secreting a thin flaky wax, leafless except on very young growth. Leaves opposite or ternate, linear-filiform, 1–3 cm. long and less than 1 mm. broad, caducous before flowering. Inflorescences terminal and lateral at the uppermost nodes, several- to many-flowered; peduncles 1–3 cm. long, minutely puberulent; pedicels 1–2 cm. long, minutely puberulent. Flowers rather mediocre; calyx lobes ovate, about 3 mm. long, minutely tomentulose; corolla reflexed-rotate, pale yellowish, greenish, or pinkish white, the lobes 6–7 mm. long; gynostegium shortly stipitate, greenish cream or white, rarely tinged with rose, the column rather narrowly obconic, about 1.5 mm. long and 2 mm. broad, the hoods subsaccate, pouched at the base above the basal attachment, deeply emarginate above, 2–3 mm. long, the horn almost wholly coalesced with the body of the hood, free and incurved above, about half longer than the hood, the anther head truncately conic, about 2 mm. long and 3.5 mm. broad. Follicles pendulous on spreading or pendulous peduncles, narrowly fusiform, long-apiculate, 9–13 cm. long, about 1 cm. broad, smooth, minutely pilosulose when young, soon glabrate; seeds oval, about 6 mm. long, the pale tawny coma about 2 cm. long.

Fig. 74. *Asclepias albicans* S. Wats.

Granite soil, sunny exposures, Colorado Desert and Lower Sonoran. Southern California and adjacent Arizona; Baja California. Blooming from March to June.

UNITED STATES:

ARIZONA: Yuma County.

CALIFORNIA: Imperial, Riverside, San Bernardino, and San Diego counties.

MEXICO: BAJA CALIFORNIA: Carmen Island, Angel de la Guardia, La Paz, Agua Caliente, Santa Rosalia, San Francisco Island, Los Angeles Bay, Pt. San Fermin Mtns., San Luis Gonzaga Bay, Tule Mtns., Ensenada, San Felipe Bay, Canyon de los Muertes, El Marmol, Puerto Escondido, South San Lorenzo Island.

Probably the shrubbiest American milkweed. The relations of this species with *A. masonii* and *A. subaphylla* are discussed under the former.

69. *ASCLEPIAS VESTITA* Hook. & Arn. Bot. Beechey Voy. 363. 1841. [T.: Douglas s. n., K!]

Herbaceous perennials. Stems clustered from the rootstalk, ascending or more or less decumbent, relatively stout, more or less ancipitous or laterally compressed, simple or infrequently branching from the base, 2–7 dm. long, more or less densely arachnoid-tomentose particularly when young, eventually glabrate. Leaves opposite, shortly petiolate, broadly ovate to ovate-elliptic or broadly lanceolate, apex acuminate, base broadly rounded and usually cordate, 4–14 cm. long, 2–5 cm. broad, firmly membranaceous and sometimes somewhat subsucculent, conspicuously arachnoid-tomentose generally when young, particularly beneath, eventually more or less glabrate; petioles 0.4–1.0 cm. long. Inflorescences terminal and solitary or also lateral at the uppermost nodes, several- to many-flowered, sessile or subsessile even when terminal; pedicels slender, 2–3 cm. long, minutely white-tomentulose. Flowers mediocre; calyx lobes lanceolate, 4–5 mm. long, minutely tomentulose; corolla reflexed-rotate, yellowish white usually more or less suffused with purple, the lobes 7–8 mm. long; gynostegium shortly stipitate, white to cream, the column broadly obconic, about 1 mm. long and 2 mm. broad, the hoods trigonal-obovate, truncate, 2–3 mm. long, the horn falciform, strongly adnate, incurved, about as long as the hood, the anther head truncately conic, about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, broadly fusiform, shortly apiculate, 5–8 cm. long, about 3 cm. thick, arachnoid-tomentose to glabrate, smooth; seeds broadly oval, about 1 cm. long, the pale tawny coma about 2.5 cm. long.

KEY TO THE SUBSPECIES

- Stems relatively stout; leaves larger; inflorescences usually lateral as well as terminal; corolla usually yellowish white or only slightly purplish. Central California.....69a. *A. vestita vestita*
 Stems relatively slender; leaves smaller; inflorescences usually terminal and solitary; corolla usually deeply suffused with purple. Southern California.....69b. *A. vestita parishii*

These two populations are not quite as well defined as other subspecies of *Asclepias*, and in such a small area as the species inhabits the intergradation may be environmental rather than genetic. Nevertheless, there is a rather strong geographical correlation.

69a. *ASCLEPIAS VESTITA* ssp. *VESTITA*.

Dry plains and low hills. Central California.
Blooming from April to July.

UNITED STATES:

CALIFORNIA: Fresno, Madera, Mariposa, Merced, Monterey, San Benito, San Joaquin, and San Luis Obispo counties.

69b. *ASCLEPIAS VESTITA* ssp. *parishii* (Jepson)

Woodson, stat. nov.

Asclepias vestita var. *parishii* Jepson, Man. Fl. Pl. Calif. 772. 1925. [T.: *Jepson 6116*, UC!]



Fig. 75. *Asclepias vestita* Hook. & Arn.

Brushy flats and hillsides, desert canyons. Southern California. Blooming from April to May.

UNITED STATES:

CALIFORNIA: Inyo, Kern, Los Angeles, San Bernardino, and Ventura counties.

70. *ASCLEPIAS NUMMULARIA* Torr. Bot. Mex. Bound. Surv. 163, t. 45. 1859.

[T.: *Bigelow s. n.*, US!]

Diminutive herbaceous perennials, more or less subscapose in appearance because of the decumbent habit and the long peduncles. Stems usually clustered from the rootstalk, decumbent to ascending, usually frequently branched, rarely simple, relatively slender and apparently more or less ancipitous or laterally compressed, 4–10 cm. long, finely tomentulose above to glabrate below. Leaves opposite, subsessile or very shortly petiolate, very broadly ovate or suborbicular to ovate-lanceolate, apex broadly rounded to acute, base broadly rounded and somewhat cordate to obtuse, 1.5–4.0 cm. long, 1–4 cm. broad, firmly membranaceous or somewhat subsucculent, more or less glaucous, finely subarachnoid-tomentulose particularly beneath, infrequently glabrate. Inflorescences terminal and subterminal at the uppermost nodes, few- to several-flowered, long-pedunculate, minutely tomentulose; peduncles 2–6 cm. long, slender; pedicels very slender, 1.5–3.0 cm. long. Flowers rather small; calyx lobes ovate, about 2 cm. long, purplish, finely pilosulose; corolla reflexed-rotate, purplish rose, the lobes about 5 mm. long; gynostegium pale rose, shortly stipitate, the column broadly obconic, about 0.5 mm. long and 2.5 mm. broad, the hoods broadly obovate, broadly obtuse or rounded at the tip, about 3 mm. long, the horn strongly adnate, very broadly falciform or reduced to a rather low crest about as long as the hood or somewhat shorter, the anther head truncately conic, 2.0–2.5 mm. long, 3.0–3.5 mm. broad. Follicles erect on deflexed pedicels, very broadly fusiform, shortly apiculate, 5–6 cm. long, 1.5–2.0 cm. broad, smooth,

Fig. 76. *Asclepias nummularia* Torr.

finely tomentulose to glabrate; seeds oval, about 6 mm. long, the pale tawny coma about 2.5 cm. long.

Rocky hillsides, arid grassland, dry ravines, in gravel or clay. Southwestern Texas and southern Arizona; northern Mexico from San Luis Potosí to Sonora. Blooming from March to August.

UNITED STATES:

ARIZONA: Cochise, Pima, and Santa Cruz counties.

TEXAS: Brewster, Jeff Davis, and Presidio counties.

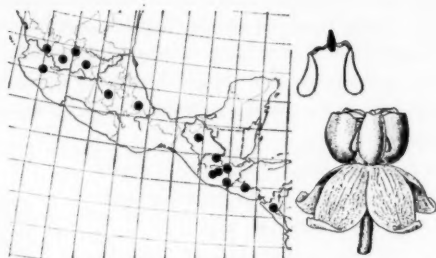
MEXICO: CHIHUAHUA: Chihuahua, Cusihiuriachic, San Luis Mtns., Hacienda de San Diego, Miñaca. DURANGO: Durango, Tepehuanes. SAN LUIS POTOSÍ: San Luis Potosí. SONORA: Nogales.

A popular name reported from Chihuahua is *yerba de cuervo*.

71. *ASCLEPIAS ROSEA* HBK. Nov. Gen. 3:189. 1819. [T.: Bonpland 3926, MO, photo!]

Asclepias senecionifolia M. E. Jones, Contr. West. Bot. 12:49. 1908. [T.: Jones s. n., MO!]

Slender herbaceous perennials from thickened fusiform rootstalks. Stems clustered from the rootstalk, ascending or decumbent, slender, simple or branching from the base, about 0.5–5.0 dm. tall, finely subarachnoid-tomentulose to glabrate. Leaves opposite, sessile, linear to filiform, gradually acuminate, 4–18 cm. long, 3–6 mm. broad, firmly membranaceous, subarachnoid-tomentulose to glabrate. Inflorescences terminal and solitary or lateral also at the upper nodes, several- to many-flowered, finely tomentulose, long-pedunculate; peduncles slender, 2–24 cm. long; pedicels very slender, about 2 cm. long. Flowers small; calyx lobes lanceolate, 2–3 mm. long, finely tomentulose; corolla reflexed-rotate, rather pale purplish pink, the lobes 5–7 mm. long; gynostegium shortly stipitate, rose or pinkish cream, the column broadly obconic, about 0.7 mm. long and 1.5 mm. broad, the hoods broadly obovate, obtuse or rounded at the tip, about 3 mm. long, the horn strongly adnate, broadly falciform, about as long as the hood or somewhat shorter, the anther head

Fig. 77. *Asclepias rosea* HBK.

truncately conic, 1.5–2.0 mm. long, 2.5–3.0 mm. broad. Follicles erect on deflexed pedicels, very narrowly fusiform, narrowly attenuate, 10–15 cm. long, somewhat less than 1 cm. broad, finely tomentulose to glabrate, smooth; seeds oval, 6–8 mm. long, the pale tawny coma about 2.0–2.5 cm. long.

Dry and rocky hills, llanos, and potreros. Southern Mexico and Guatemala. Blooming from December to June.

MEXICO: CHIAPAS: Monserrate. GUANAJUATO: Guanajuato, Silao. JALISCO: Jacala, Guadalajara, Altanguillo, Tapalpa, Santa Cruz. MEXICO: Temascaltepec.

GUATEMALA: CHIMALTENANGO: Alameda. GUATEMALA: Guatemala, Finca La Aurora. QUICHE: locality lacking. SANTA ROSA: Estanzuela, Santa Rosa. SOLOLA: Volcán San Pedro.

Popular names reported in Guatemala are *platanillo* and *bonetillos*, and in Mexico the usual *lechetresna*.

Series 9. FRUTICOSAE

72. ASCLEPIAS FRUTICOSA L. Sp. Pl. 216. 1753. [T.: Linn. Herb., London, no. 310.23, photo!]

Gomphocarpus fruticosus (L.) R. Br. in Mem. Wern. Soc. 1:38. 1809.

Gomphocarpus angustifolius Link, Enum. Hort. Berol. 1:251. 1821–22, ex char.

Gomphocarpus arachnoides Fourn. in Bull. Soc. Bot. France 14:250. 1867, ex char.

Gomphocarpus brasiliensis Fourn. in Mart. Fl. Bras. 6⁴:203, pl. 53. 1885, ex ic. [T.: Glaziov 6706.]

Gomphocarpus fruticosus f. *brasiliensis* (Fourn.) Briq. in Kgl. Sv. Vet. Akad. Handl. 34⁷:21. 1900.

Asclepias brasiliensis (Fourn.) Schltr. in Mededel. Rijks Herb. 29:12. 1916.

Stout suffrutescent perennials. Stems relatively stout, branching rather frequently, about 1–2 m. tall, finely puberulent to glabrate. Leaves opposite, subsessile, narrowly lanceolate to oblong-lanceolate, acuminate, base acute, 4–15 cm. long, 1–2 cm. broad, finely pilosulose to glabrate. Inflorescences lateral and solitary from the upper nodes, several-flowered, pedunculate, inconspicuously puberulent; peduncles slender, 2–3 cm. long; pedicels very slender, about 2 cm. long. Flowers rather large; calyx lobes lanceolate, 2–3 mm. long, minutely puberulent; corolla reflexed-rotate, white, the lobes 7–8 mm. long; gynostegium rather shortly stipitate,

cream or white flushed with purple or violet, the column obconic, about 2 mm. long and 3 mm. broad, the hoods strongly conduplicate, broadly lyriform with 2 conspicuous falciform lobes, about 3 mm. long, without a horn, the anther head truncate conic, about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, broadly ovoid, 5-8 cm. long, minutely puberulent, closely beset with slender filiform spines.

Waste places particularly about dwellings; sporadically introduced into Jamaica and South America from Africa. Blooming from December to July.

To be complete, the synonymy probably should include a number of names from Africa, notably *Gomphocarpus physocarpus* E. Mey. Although I have seen no specimens from Mexico, Fournier's description of *Gomphocarpus arachnoideus*, which was described from horticultural material supposedly from Mexico, seems to apply to this species. I have not been able to see the type. Similarly, Fournier's *G. brasiliensis*, which is illustrated by an excellent plate in Martius' 'Flora Brasiliensis', is surely the African species. Although introduced into America for at least a century, *A. fruticosa* has not spread greatly and still is collected very infrequently.



Fig. 78. *Asclepias fruticosa* L.

SUBGENUS II. *PODOSTEMMA* (Greene) Woodson, stat. nov.

Podostemma Greene, Pittonia 3:235. 1897. [T.: *P. longicornu* (Benth.) Greene.]

KEY TO THE SPECIES

- a. Anther wings salient at the base; inflorescences definitely pedunculate.
 - b. Plants herbaceous; leaves broadly laminate, persistent; flowers relatively large, the corolla lobes about 1.5 cm. long; hoods somewhat attenuate to the tip, with 2 very prominent laminate auricles at the base; horns narrowly clavate, attached about midway within the hoods. Jalisco to Chiapas; Guatemala.....73. *A. auriculata*
 - bb. Plants suffruticose; leaves filiform and soon caducous; flowers smaller, the corolla lobes about 1 cm. long; hoods dilated at the tip, rather inconspicuously carinate at the base; horns reduced to rather inconspicuous crests almost wholly adnate to the hoods; follicles pendulous or subpendulous. Southern California and adjacent Arizona and Nevada; Baja California and coastal Sonora and Sinaloa.....74. *A. subulata*
- aa. Anther wings salient at about the middle; inflorescences typically sessile or subsessile.
 - b. Hoods at least two to three times as long as the anther head.
 - c. Hoods somewhat spreading at the tips, broadly rounded to somewhat quadrangular, entire to slightly emarginate, the horn not quite wholly adnate; flowers relatively large, the corolla lobes typically somewhat longer than 1 cm.
 - d. Hoods about three times as long as the anther head, not attenuate toward the base. Southern New Mexico and Arizona and adjacent California.....75. *A. nyctaginifolia*
 - dd. Hoods about twice as long as the anther head, conspicuously attenuate toward the base. Southwestern Texas and southern New Mexico; Tamaulipas to Chihuahua and southward to Yucatan and Chiapas; Guatemala; Honduras; El Salvador; Nicaragua; Costa Rica76. *A. oenotheroides*
 - cc. Hoods essentially erect, the tip deeply 2-lobed, the horn adnate to the sinus and enclosing the hood from above; flowers smaller, the corolla lobes typically somewhat less than 1 cm. long. Southwestern Texas; northern Nuevo León and Tamaulipas77. *A. emoryi*
 - bb. Hoods about as long as the anther head or only slightly longer; flowers relatively small, the corolla lobes about 7 mm. long. Sinaloa78. *A. standleyi*

This is a fairly natural group of species, with the exception of *A. auriculata* which might at least be included within a series of its own apart from the rest. Nevertheless, *A. obovata* of subgenus *ASCLEPIAS* approaches *PODOSTEMMA* rather closely (particularly *A. nyctaginifolia*), and the hoods of *A. standleyi* are so short that it has little in general appearance of the flower to ally it with the others.

73. *ASCLEPIAS AURICULATA* HBK. Nov. Gen. 3:191, *t.* 228. 1819, ex ic. [T.: *Bonpland s. n.*]

Oltaria auriculata (HBK.) G. Don, Gen. Syst. 4:144. 1838.

Oltaria fragrans Benth. Pl. Hartw. 89. 1842. [T.: *Hartweg s. n.*, MO photo!]

Asclepias fragrans (Benth.) Dcne. in DC. Prodr. 8:571. 1844.

Asclepias mazatlanensis Sessé & Moc. La Naturaleza Ser. II, 1:app. 43. 1887. [T.: Sessé & Mocinoño 843, F!]

Asclepias purpusii Brandg. in Zoe 5:251. 1908. [T.: *Purpus 2090*, MO!]

Asclepias plumerifolia Goyena, Fl. Nicaraguense 2:658. 1911, ex char.

Stout herbaceous perennials. Stems relatively stout, simple, 6–20 dm. tall, inconspicuously puberulent above, eventually glabrate. Leaves opposite, shortly petiolate, elliptic to oblong, apex rather shortly acuminate, base acute to obtuse, 10–15 cm. long, 1.5–6.0 cm. broad, thinly membranaceous, dark green and essen-

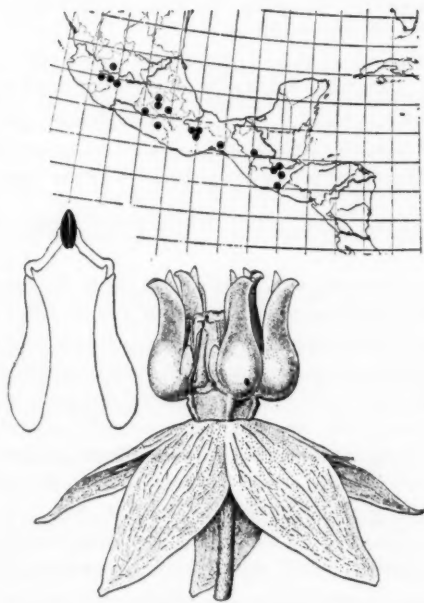


Fig. 79. *Asclepias auriculata* HBK.

tially glabrous above, paler and inconspicuously puberulent beneath; petioles 0.4–1.0 cm. long. Inflorescences subterminal and lateral at the upper nodes, few to several, rather shortly pedunculate, several- to many-flowered; peduncles rather slender, 3–5 cm. long, inconspicuously puberulent; pedicels rather slender, 2.5–3.0 cm. long, minutely puberulent. Flowers large; calyx lobes lanceolate, 7–8 mm. long, usually dark purple, minutely puberulent; corolla rotate or reflexed-rotate, greenish white sometimes tinted with rose at the base, the lobes 1.2–1.5 cm. long; gynostegium shortly stipitate, white to pale lavender or rose, the column broadly obconic, about 4 mm. long and 5 mm. broad, the hoods ovate-oblong, 7–10 mm. long, the base enlarged and spongy-solid, auriculate at the base, the tip somewhat narrowed and laminate, the horn about half adnate and confluent with the base, compressed-clavate, about as long as the hood or somewhat shorter, the anther head cylindrical, about 4 mm. long and broad. Follicles unknown.

Rocky hills, open pine and oak forests. Southern Mexico; Guatemala. Blooming from June to October.

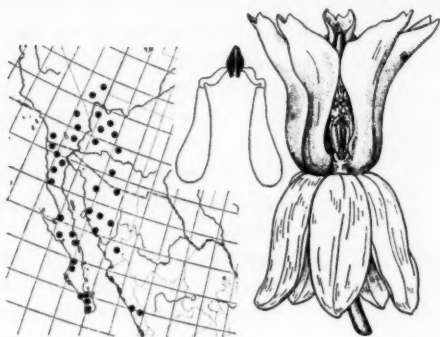
MEXICO: CHIAPAS: Tonalá, Mt. Tacaná. GUERRERO: Mina, Aguazarca, Cuchara. JALISCO: San Sebastián, Arroyo Seco, Sierra de la Campana, Sierra del Tigre, Guadalajara. MEXICO: Temascaltepec. MICHOACAN: Uruapán. MORELOS: Cuernavaca, Herradura. OAXACA: Cerro San Felipe, Nochixtlán, Jayacatlán. PUEBLA: Pahuatlán.

GUATEMALA: Guatemala, La Aurora, San Juan Sacatepequez. SANTA ROSA: Carrizal. ZACAPA: Sierra de las Minas.

I am embarrassed not to be able to describe the fruit of *A. auriculata*; for such a relatively frequent and widely distributed species fruit must have been collected. As it happens, *A. similis*, which has nearly the same distribution, looks almost precisely like *A. auriculata* when not in flower, and I am sure that I must have wrongly identified some fruiting plants of the latter species with the name of the former.

74. *ASCLEPIAS SUBULATA* Dcne. in DC. Prodr. 8:571. 1844. [T.: Herb. Pavon, FI!]

Slender twiggy undershrubs, somewhat resembling an Ephedra. Stems clustered from the base, slender, simple or branching, about 1–2 m. tall, leafless except when very young, glabrous. Leaves opposite or ternate, caducous before flowering, sessile, linear or filiform, 2–8 cm. long, about 1–2 mm. broad. Inflorescences lateral from few to several of the upper nodes, few- to several-flowered, shortly pedunculate; peduncles relatively stout, 1–2 cm. long, very minutely puberulent; pedicels more slender, 1.0–1.5 cm. long, minutely puberulent. Flowers rather large; calyx lobes lanceolate, about 3 mm. long; corolla reflexed-rotate, pale yellowish white, the lobes 9–11 mm. long; gynostegium shortly stipitate, cream, the column broadly obconic, about 1 mm. long and 2.5 mm. broad, the hoods broadly obovate-flabellate, 9–10 mm. long, narrowed to a solid slightly laminate stipe somewhat above midway, the expanded blade acute, emarginate and indefinitely laminate, the horn wholly adnate and reduced to an undulate crest, slightly shorter than the hood, the anther head conic, about 3.0–3.5 mm. long and 4–5 mm. broad. Follicles on pendulous or subpendulous peduncles, narrowly fusiform, narrowly attenuate, 8–14 cm. long,

Fig. 80. *Asclepias subulata* Dcne.

about 1 cm. thick, smooth, minutely puberulent to glabrate; seeds oval, about 6 mm. long, the pale tawny coma about 3–4 cm. long.

Deserts, chiefly along arroyos and washes. Southern California and adjacent Arizona and Nevada; Baja California and western Sonora. Blooming sporadically throughout the year.

UNITED STATES:

ARIZONA: Pima, Pinal, Maricopa, Mohave, and Yavapai counties.

CALIFORNIA: Imperial, Riverside, San Bernardino, and San Diego counties.

NEVADA: Clark and Lincoln counties.

MEXICO: BAJA CALIFORNIA: Todos Santos, La Paz, Tijuana, San Isidro Ranch, Santa María Bay, Cape San Lucas, San Juanico Bay, San José del Cabo, Mesquital, Ensenada, Santo Tomás, Ojos Negros, Mulege, San Bartolo, Guadalupe, Santa Rosalía, San Ignacio, San Bartolomé Bay, Rosario, San Felipe Bay, Santo Domingo. SONORA: Guaymas, Quitovac, Hermosillo, Villa Seris, Bahía Kino, Torres Palma, Río Mayo, Nogales, Caborca. SINALOA: San Ignacio, San Blas.

An extremely uniform species as far as floral structure is concerned. The caducous leaves of both *A. subulata* and *A. albicans* may be either opposite or ternate. It is fortunate that plants of both species, as well as those of *A. masonii* and *A. subaphylla*, usually fruit and bloom at the same time, for otherwise they would be almost indistinguishable in fruit.

75. *ASCLEPIAS NYCTAGINIFOLIA* A. Gray, in Proc. Amer. Acad. 12:69. 1877.

[T.: E. Palmer s. n., MO!]

Asclepias wrightii Greene, ex A. Gray, in Proc. Amer. Acad. 16:102. 1881. [T.: C. Wright s. n., MO!]

Podostemma nyctaginifolium (A. Gray) Greene, Pittonia 3:237. 1897.

Rather low herbaceous perennials. Stems clustered from the base, ascending or decumbent, relatively slender, simple or rarely branching from the base, 1.5–2.0 dm. tall, finely puberulent. Leaves opposite, long-petiolate, ovate-subrhombic, apex acute to obtuse, base broadly obtuse or rounded and abruptly cuneate into the

petiole, 6–10 cm. long, 2–4 cm. broad, membranaceous, finely puberulent particularly beneath; petioles 1–3 cm. long. Inflorescences lateral and solitary at few to several of the upper nodes, few- to several-flowered, sessile or subsessile; pedicels



Fig. 81. *Asclepias myctaginifolia* A. Gray

rather stout, about 2 cm. long, finely puberulent. Flowers large; calyx lobes ovate-lanceolate, about 4 mm. long, minutely puberulent. Corolla rotate or reflexed-rotate, pale greenish yellow slightly tinted with purple without, the lobes 1.2–1.4 cm. long; gynostegium shortly stipitate, pale greenish cream, the column shortly obconic, about 0.5 mm. long and 1 mm. broad, the hoods broadly oval or oblong, about 1 cm. long, not noticeably attenuate at the base, the tip rounded and obscurely repand, the horn almost wholly adnate, virtually reduced to a broad apiculate crest, slightly shorter than the hood, the anther head broadly truncate-conic, about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, broadly fusiform, shortly apiculate, 3–5 cm. long, 1.5–3.0 cm. broad, minutely tomentellous to glabrate; seeds unknown.

Arroyos, springs, and swales. Southern New Mexico and Arizona and adjacent California (New York and Providence mountains). Blooming from May to August.

UNITED STATES:

ARIZONA: Cochise, Mohave, and Pima counties.

CALIFORNIA: San Bernardino County.

NEW MEXICO: Grant, Guadalupe, and Sierra counties.

76. *ASCLEPIAS OENOTHEROIDES* Cham. & Schlecht. in *Linnaea* 5:123. 1830. [T.: Schiede & Deppe 256, K!]

Asclepias longicornu Benth. Pl. Hartw. 24. 1839. [T.: Hartweg 214, K!]

Asclepias lindheimeri Engelm. & Gray, in *Boston Jour. Nat. Hist.* 5:250. 1845. [T.: Lindheimer 272, MO!]

Asclepias brevicornu Scheele, in *Linnaea* 21:756. 1848, ex char. [T.: Roemer s. n.]

Asclepias amoena R. & P. ex Hemsl. *Biol. Centr.-Amer. Bot.* 2:325. 1881, nom. nud., non L.

Podostemma lindheimeri (Engelm. & Gray) Greene, *Pittonia* 3:236. 1897.

Podostemma longicornu (Benth.) Greene, loc. cit. 1897.

Podostemma australe Greene, loc. cit. 238. 1897. [T.: C. Wright s. n., US!]

Podostemma helleri Greene, loc. cit. 236. 1897. [T.: Heller 1575, MO!]

Low herbaceous perennials. Stems clustered from the rootstalk, ascending or decumbent, moderately stout, more or less branched from the base or simple, 0.5–4.5 dm. long, minutely puberulent. Leaves opposite, rather long-petiolate, rhombic-ovate to oblong-lanceolate, apex obtuse to acute, base acute to broadly obtuse and abruptly cuneate to the petiole, 4–12 cm. long, 1–6 cm. broad, firmly membranaceous, pale green, minutely puberulent particularly beneath; petioles 1–2 cm. long. Inflorescences lateral and solitary from few to several of the upper nodes, very shortly pedunculate or subsessile, several-flowered; peduncles 1–2 cm. long or nearly obsolete, minutely puberulent; pedicels rather slender, 1.5–2.5 cm. long, minutely puberulent. Flowers mediocre; calyx lobes ovate-lanceolate, 3–4 mm.

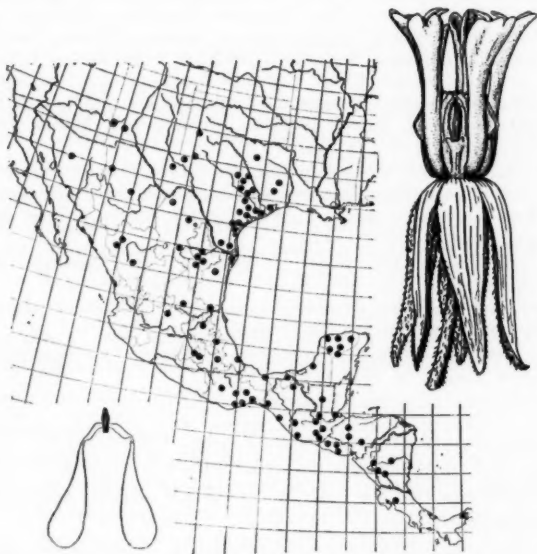


Fig. 82. *Asclepias oenotheroides* Cham. & Schlecht.

long, minutely puberulent; corolla reflexed-rotate, greenish white or yellow, the lobes 0.8–1.4 cm. long; gynostegium very shortly stipitate, pale greenish cream, the column broadly obconic, about 1.5 mm. long and 2.5 mm. broad, the hoods narrowly obovate-flabellate, 7–10 mm. long, conspicuously narrowed to a narrowly laminate stipe from somewhat above the middle, the tip broadly laminate and minutely erose or repand, the horn adnate to near the tip of the hood, the free portion falciform and incurved, usually accompanied by a smaller posterior appendage, the anther head truncate-conic, about 3 mm. long and 4–5 mm. broad. Follicles erect on deflexed pedicels, broadly fusiform or ovoid, shortly apiculate, 7–9 cm. long, 1.5–2.0 cm. broad, smooth, minutely pilosulose to glabrate; seeds oval, 6–8 mm. long, the pale tawny coma 2.0–2.5 cm. long.

Rocky, chiefly clay soil in llanos, mesas, and hills, in fields and thickets, along roadsides. Southern Texas and New Mexico; central Mexico from Tamaulipas to Sonora and southward to Chiapas and Yucatan; Guatemala; Honduras; El Salvador; Nicaragua; Costa Rica. Blooming from February to October.

UNITED STATES:

NEW MEXICO: Chaves, Dona Ana, and Grant counties.

TEXAS: Bastrop, Bell, Burnet, Caldwell, Cameron, Colorado, Crane, Dallas, De Witt, Galveston, Goliad, Gonzales, Grimes, Hays, Hidalgo, Jackson, Jim Wells, Lubbock, Matagorda, Nueces, Pecos, San Patricio, and Travis counties.

MEXICO: CAMPECHE: Champotón. CHIAPAS: Paderon, Tonalá, Mapastepec, Monserrate. CHIHUAHUA: Ciudad Jimenez, Chihuahua, Casas Grandes. COAHUILA: Allende, Sabinas, Saltillo, Morano, Puerto Colorado. DURANGO: Santiago Papasquiaro, Tepehuanes, Durango. GUANAJUATO: Irapuato. HIDALGO: Jacala. MORELOS: Cuernavaca, Yautepec. NUEVO LEÓN: Monterrey, Villa Santiago, Sabinas Hidalgo, Galeana. OAXACA: Oaxaca, Totolapán, Soledad de Esla, Tehuantepec, Jamiltepec, San Matéo del Mar. PUEBLA: San Luis Tultitlanapa, Tlacuilotepic. SAN LUIS POTOSÍ: Chijol, San Luis Potosí, Charcas. SONORA: Magdalena. TABASCO: Estapilla. TAMAULIPAS: Washington Beach, San José. VERACRUZ: Coatzacoalcos, Vera Cruz. YUCATAN: Ticul, Dzitás, Tecantun, Chichen Itza, Mérida, Izamal, Xcaba-kunché, Progreso, Chichankanab, Valladolid.

GUATEMALA: GUATEMALA: Guatemala. IZABAL: Gualán. JUTIAPA: El Barrial, Atescatempa. PETEN: La Libertad, Tayasal. PROGRESO: El Rancho. RETALHULEU: Champerico, Nueva Linda, Retalhuleu. SAN MARCOS: Ayutla. SANTA ROSA: Chiquimulilla. ZACAPA: Zacapa, La Fragua, Estanzuela, Santa Cruz.

HONDURAS: COMAYAGUA: Comayagua. EL PARAISO: Danlí. MORAZAN: El Zamorano, Tegucigalpa, Toncontin.

EL SALVADOR: AHUACHAPAN: Ahuachapán. LA UNION: La Union. SAN VICENTE: San Vicente. SONSONATE: Sonsonate, Acajutla, Izalco.

NICARAGUA: CARAZO: Jinotepe. CHINANDEGA: Corinto, Chichigalpa, Chinandega. GRANADA: Granada. MANAGUA: Managua.

COSTA RICA: GUANACASTE: Paso Temisque.

Popularly known as *matacoyote* in El Salvador, and *leche perro* in Costa Rica.

The flowers of *A. oenotheroides* are structurally about the most elegantly contrived of all milkweeds, but the color is very dingy and the whole aspect of the plant is extraordinarily weedy.

It is unfortunate to have to displace the familiar name *longicornu* in favor of *oenotheroides*, but there can be no doubt of the necessity for doing so. There is considerable variation in the size of the flowers and also in such structural features as the small posterior horn of the hoods, but I have noticed no geographical pattern. Some of the variation may be due to occasional hybridization with *A. emoryi*.

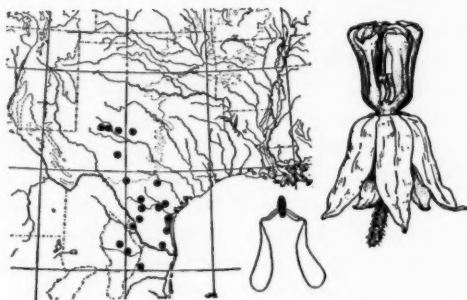
77. *ASCLEPIAS EMORYI* (Greene) Vail, ex Small, Fl. Southeast. U. S. 948. 1903.

Podostemma emoryi Greene, Pittonia 3:237. 1897. [T.: *Thurber s. n.*, US!]

Podostemma leoninum Greene, loc. cit. 1897. [T.: *Pringle 2519*, MO!]

Asclepias bartlettiana Woodson, in Amer. Jour. Bot. 22:688, pl. 1, fig. 3. 1935. [T.: *Bartlett 10659*, MICH!]

Low herbaceous perennials. Stems usually clustered from the rootstalk, ascending or decumbent, rather slender, more or less branched from the base or simple,

Fig. 83. *Asclepias emoryi* (Greene) Vail

1-2 dm. long, minutely puberulent. Leaves opposite, rather long-petiolate, rhombic-ovate to narrowly oblong-lanceolate particularly above, apex obtuse to narrowly acute, base acute to obtuse and abruptly cuneate into the petiole, 4-8 cm. long, 0.6-4.0 cm. broad, firmly membranaceous, pale green, minutely puberulent particularly beneath; petioles 1.0-1.5 cm. long. Inflorescences lateral and solitary from few to several of the upper nodes, shortly pedunculate to sessile; peduncles obsolete to 2 cm. long, densely puberulent; pedicels rather slender, 1-2 cm. long, minutely puberulent. Flowers rather small; calyx lobes lanceolate, 3-4 mm. long, minutely puberulent; corolla reflexed-rotate, dingy greenish yellow, the lobes 6-7 mm. long; gynostegium very shortly stipitate or essentially obsolete, pale greenish cream, the column broadly obconic, about 1 mm. long and 1.5 mm. broad, the hoods oblanceolate, about 5 mm. long, conspicuously narrowed to a narrowly laminate stipe from near the tip, the tip laminate and rather deeply emarginate, the horn wholly adnate to the sinus and more or less linguiform, enclosing the hood from above (rarely ascending), the anther head truncate-conic, about 1.5 mm. long and broad. Follicles erect on deflexed pedicels, more narrowly fusiform, rather narrowly attenuate, 6-9 cm. long, 1.0-1.5 cm. broad, minutely puberulent to glabrate; seeds broadly oval, about 8 mm. long, the pale tawny coma 2.5-3.5 cm. long.

Sandy prairies and dry plains, spreading to roadsides and railways. Southwestern Texas; northeastern Mexico. Blooming from April to August.

UNITED STATES:

TEXAS: Bee, Callahan, Frio, Guadalupe, Hidalgo, Howard, Kleberg, La Salle, Live Oak, Mitchell, Nolan, Nueces, Schleicher, Uvalde, and Webb counties.

MEXICO: NUEVO LEON: Obisado, Monterrey. TAMAULIPAS: Nuevo Laredo, San Miguel.

The typical extremes of *A. emoryi* are very easy to distinguish from typical *A. oenotheroides* by their floral structure, as the accompanying illustrations show; but rather frequent intergradations occur, possibly the result of at least occasional hybridization.

78. *Asclepias standleyi* Woodson, spec. nov.

Herbae perennes humiles. Caules ascendentes vel decumbentes validiuscules simplices ca. 1-4 dm. alti minute puberuli. Folia opposita longe petiolata lanceolata acuminata basi attenuata 5-10 cm. longa 1-3 cm. lata firme membranacea pallide viridia minute puberula; petiolis 1-2 cm. longis. Inflorescentiae plures vel multae pluriflorae sessiles vel subsessiles; pedicellis graciliusculis ca. 1 cm. longis dense puberulis. Flores parvi; calycis laciniis ovato-lanceolatis ca. 3 mm. longis minute puberulis; corolla reflexo-rotata sordide gilva, lobis 7-8 mm. longis; gynostegio subsessili sordide gilvo, columna subnulla, cucullis valde conduplicatis subquadratis ca. 4 mm. longis basi solidis apicem versus paullo laminatis, cornu per longitudinem adnato cristato, androecio ca. 2 mm. longo 3 mm. lato. Folliculi erecti e pedicellis deflexis latiscule fusi-formes breviter apiculati ca. 7-8 cm. longi 1.5 cm. crassi laeves minutissime puberuli glabrati; seminibus late ovalibus ca. 8-9 mm. longis, coma alba ca. 2.5 cm. longa.—Holotypus: J. G. Ortega 4548 in Herb. U. S. Nat. Mus. (Las Palmas, Sinaloa, Mexico, 1922).

MEXICO: SINALOA: Las Palmas, Fuerte.

This species also has been collected by Rose, Standley, & Russell (no. 13568 in Herb. U. S. Nat. Mus.) at Fuerte, Sinaloa. The hoods of *A. standleyi* are so short that, were it not for the characteristic aspect of the foliage, it might be mistaken for one of the ROSEAE of the subgenus ASCLEPIAS. Ortega reports the popular name as *hierba de la mula*.

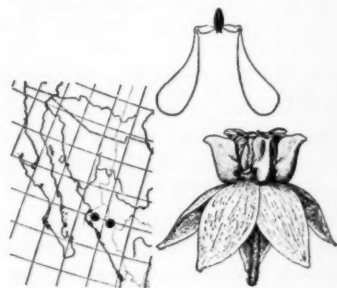


Fig. 84. *Asclepias standleyi* Woods.

SUBGENUS III. ANANTHERIX (Nutt.) Woodson, stat. nov.

Anantherix Nutt. Gen. North Amer. Pl. 1:169. 1818; A. Gray, in Proc. Amer. Acad. 12:66. 1877. [T.: *A. connivens* (Baldw.) Feay, ex Wood.]

79. *Asclepias connivens* Baldw. ex Ell. Sketch Bot. South Car. & Ga. 1:320. 1821, ex char.

Acerates connivens (Baldw.) Dcne. in DC. Prodr. 8:521. 1844.

Anantherix connivens (Baldw.) Fay, ex Wood, Classb. Bot. 584. 1861; A. Gray, in Proc. Amer. Acad. 12:66. 1877.

Herbaceous perennials. Stems rather stout, simple, 2-9 dm. tall, inconspicuously pilosulose to glabrate. Leaves opposite, sessile or subsessile, oval to oblong-elliptic below, becoming narrower and smaller above, apex acute to obtuse, base obtuse or rounded, 5-7 cm. long, 1.0-2.5 cm. broad, firmly membranaceous, somewhat

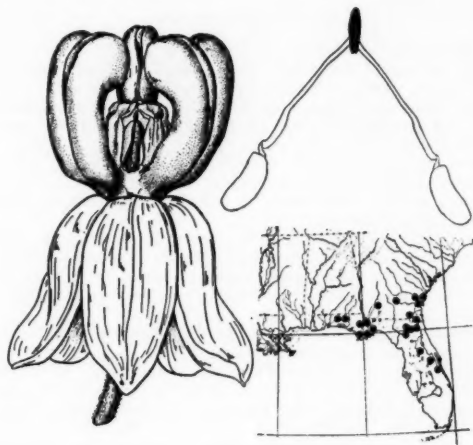


Fig. 85. *Asclepias connivens* Baldw.

glaucous, very inconspicuously pilosulose to glabrous. Inflorescences terminal and lateral at the uppermost nodes, few- to several-flowered, shortly pedunculate; peduncles 1.5–3.5 cm. long, relatively stout; pedicels more slender, 1.0–1.5 cm. long. Flowers large; calyx lobes lanceolate, 4–5 mm. long, glabrous; corolla reflexed-rotate, pale greenish yellow, the lobes 1.2–1.5 cm. long; gynostegium sessile or subsessile, the hoods involute-clavate, erect or ascending, scarcely laminate, 7–9 mm. long, with a low adnate crest within, pale greenish cream, the anther head truncate-conic, about 4 mm. long and 5 mm. broad. Follicles erect on deflexed pedicels, narrowly fusiform, gradually attenuate, 12–15 cm. long, smooth, essentially glabrous; seeds broadly oval, about 1 cm. long, the pale tawny coma about 4.5 cm. long.

Low pine woods and barrens, flatwoods, marshes. Northern Florida and southeastern Georgia. Blooming from June to August.

UNITED STATES:

FLORIDA: Alachua, Bradford, Brevard, Calhoun, Clay, Duval, Franklin, Gadsden, Gulf, Lake, Orange, Wakulla, and Walton counties.

GEORGIA: Charlton, Coffee, McIntosh, Wayne, and Worth counties.

One of the strangest species of *Asclepias*, rather resembling a terrestrial orchid. The flowers are very fragrant.

SUBGENUS IV. ASCLEPIODELLA (Small) Woodson, subgen. nov.

Asclepiodella Small, Man. Southeast. Fl. 1073. 1933. [T.: *A. feayi* (Chapm.) Small]

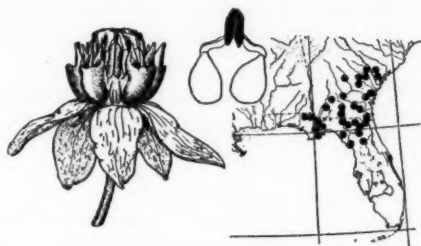
KEY TO THE SPECIES

- a. Hoods with an internal horn or crest.
 - b. Horns or crests compressed tangentially; hoods delicately petalaceous; follicles erect on erect pedicels, very narrowly fusiform; leaves opposite, filiform.
 - c. Corolla white tinged with purple without, the lobes reflexed at anthesis; hoods with very conspicuous marginal auricles; column short but evident. South Carolina, southern Georgia and northern Florida80. *A. cinerea*
 - cc. Corolla white, the lobes somewhat ascending at anthesis; hoods without marginal auricles; column obsolete. Peninsular Florida81. *A. feayi*
 - bb. Horns compressed radially; hoods more or less fleshy and inflated; flowers reddish purple; follicles broadly fusiform.
 - c. Plants usually rather stout, branching frequently; leaves normally opposite, linear-lanceolate, narrowly acuminate; inflorescences lateral, numerous, shortly but obviously pedunculate; follicles erect on deflexed pedicels. Southwestern Texas and southern New Mexico and Arizona; Coahuila to Sonora and southward to Guanajuato.....82. *A. brachystephana*
 - cc. Plants very small, branching only at the caudex; leaves approximate; inflorescences terminal or subterminal, rarely lateral, sessile.
 - d. Leaves essentially isophyllous, broadly ovate; plants densely tomentulose; follicles erect on somewhat deflexed pedicels. Southern Utah and Nevada.....83. *A. ruthiae*
 - dd. Leaves isophyllous, filiform; plants inconspicuously puberulent; follicles pendulous or weakly ascending. Southern Utah and northern Arizona.....84. *A. cutleri*
 - ddd. Leaves heterophyllous, the lowermost ovate, sharply grading to linear-lanceolate above; plants inconspicuously puberulent; (follicles unknown). New Mexico and eastern Colorado85. *A. uncialis*
 - aa. Hoods without a horn or crest, more or less fleshy and inflated; plants glabrous; leaves ovate, cordate, sessile and deeply amplexicaul; corolla reddish purple; follicles erect on deflexed pedicels. Northern California and adjacent Oregon and Nevada.....86. *A. cordifolia*

At one time (in Ann. Missouri Bot. Gard. 28:205. 1941) I tentatively placed these species in three subgenera: one for *A. cinerea* and *A. feayi*, one for *A. brachystephana* and its relatives, and one for *A. cordifolia*. Actually I still believe it might be more natural to maintain such a division here, perhaps as three series. But so few species are involved and the differences are so slight and of such little consequence in other subgenera that I do not feel enough inclined to do so, since the character which holds them together (the open saccate cucullate hood) is the chief consideration.

80. *ASCLEPIAS CINEREA* Walt. Fl. Carol. 105. 1788, ex char.

Slender herbaceous perennials from rather fleshy fusiform rootstalks. Stems very slender, simple, 3-6 dm. tall, very inconspicuously puberulent in decurrent lines from the nodes. Leaves opposite, sessile, linear or filiform, 6-8 cm. long, 1-2 mm. broad, membranaceous, glabrous. Inflorescences terminal or subterminal and usually lateral from few to several of the uppermost nodes, few- to several-flowered, shortly pedunculate; peduncles 0.5-1.0 cm. long; pedicels slender, about 2 cm. long. Flowers mediocre; calyx lobes ovate-lanceolate, about 2 mm. long, purplish, essentially glabrous; corolla reflexed-rotate at anthesis, white more or less suffused with purple, the lobes about 6 mm. long; gynostegium very shortly stipitate, white, the column about 2 mm. long and 1 mm. broad, the hoods delicately petalaceous, deeply saccate, about 2-3 mm. long, with very conspicuous acuminate marginal auricles, the horn adnate to about the middle, acicular, somewhat longer than the hood, the anther head about 2 mm. long and 2.5 mm. broad. Follicles erect on

Fig. 86. *Asclepias cinerea* Walt.

erect pedicels, narrowly fusiform, gradually attenuate, 10–12 cm. long, about 5 mm. thick, smooth, glabrous; seeds broadly oval, about 8 mm. long, the white coma about 4 mm. long.

Pine woods and barrens, sandy ridges, spreading to meadows. Northern and central Florida, southern Georgia, southern South Carolina. Blooming from May to August.

UNITED STATES:

FLORIDA: Alachua, Baker, Bradford, Calhoun, Columbia, Dixie, Duval, Franklin, Gadsden, Hamilton, Holmes, Jackson, Levy, Liberty, Marion, Nassau, Suwannee, and Union counties.

GEORGIA: Ben Hill, Bullock, Candler, Charlton, Laurens, Lanier, Liberty, Lowndes, Mitchell, Screven, Toombs, Wayne, and Ware counties.

SOUTH CAROLINA: Hampton and Jasper counties.

The prominent erect marginal auricles make it appear that the hoods contain three horns.

81. *ASCLEPIAS FEAYI* Chapm. ex A. Gray, in Proc. Amer. Acad. 12:72. 1877. [T.: *Chapman s. n.*, MO!]

Acerates feayi (Chapm.) Chapm. ex Coulter, Bot. Gaz. 3:12. 1878.

Asclepias simpsoni Chapm. Fl. South. U. S. ed. 2, 693. 1892. [T.: *Simpson s. n.*, MO!]

Asclepiodora feayi (Chapm.) Chapm. loc. cit. ed. 3, 349. 1897.

Asclepiodella feayi (Chapm.) Small, Man. Southeast. Fl. 1073. 1933.

Slender herbaceous perennials from slender fleshy rootstalks. Stems very slender, simple, 1.5–3.5 dm. tall, very inconspicuously puberulent in lines decurrent from the nodes. Leaves opposite, sessile, filiform, 7–9 cm. long, 1–2 mm. broad, delicately membranaceous, glabrous. Inflorescences terminal and solitary or also lateral from a few of the uppermost nodes, few-flowered, shortly pedunculate; peduncles slender, 0.5–1.5 cm. long; pedicels very slender, 1.0–1.5 cm. long. Flowers fairly large; calyx lobes ovate, 2–3 mm. long, purplish, glabrous; corolla rotate, white, the lobes about 1 cm. long; gynostegium sessile or subsessile, white, delicately petalaceous, the hoods broadly oval, about 3 mm. long, without marginal auricles, the horn reduced to a low wholly adnate crest, the anther head truncately conic, about 2 mm. long and 3 mm. broad. Follicles erect on erect pedicels, narrowly

fusiform, gradually attenuate, 9–12 cm. long, about 5 mm. thick, smooth, glabrous; seeds oval, about 7 mm. long, the white coma about 3.5 cm. long.

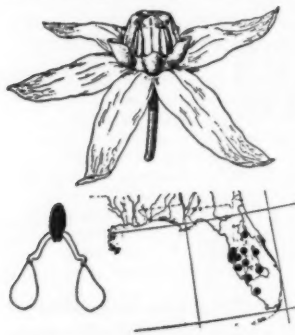


Fig. 87. *Asclepias feayi* Chapm.

what reminiscent of either *A. cinerea* or *A. feayi*. The floral structure is very difficult to examine, but seems to be somewhat intermediate as well, although somewhat suggestive of *A. verticillata*! It may be a natural hybrid, but has never been recollected.

Pine barrens, flatwoods, spreading to railways. Central Florida. Blooming from April to July.

UNITED STATES:

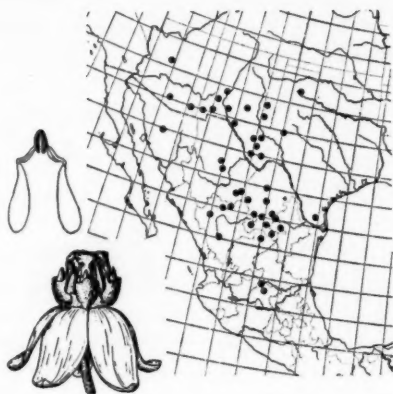
FLORIDA: Collier, Hardee, Highlands, Hillsborough, Lake, Lee, Manatee, Osceola, Pasco, Pinellas, and Polk counties.

Asclepias simpsonii is still an enigma to me. The specimen collected by Dr. Simpson in the herbarium of the Missouri Botanical Garden is not very well preserved. Superficially, it is some-

82. *ASCLEPIAS BRACHYSTEPHANA* Engelm. ex Torr. Bot. Mex. Bound. Surv. 163. 1859. [T.: Wright 1692, MO!]

Herbaceous perennials. Stems clustered from the rootstalk, rather slender, branching repeatedly toward the base, 1–4 dm. tall, minutely tomentulose when young, soon becoming glabrate. Leaves opposite, shortly petiolate, lanceolate to linear-lanceolate, narrowly acuminate, the base acute to obtuse, 6–12 cm. long, 0.5–1.2 cm. broad, firmly membranaceous, more or less conduplicate, minutely white-tomentulous when young, soon becoming glabrate; petioles 3–10 mm. long. Inflorescences lateral and solitary at the upper nodes, shortly pedunculate, several to many-flowered; peduncles rather slender, 0.8–3.0 cm. long, conspicuously white-tomentulose; pedicels very slender, 1–2 cm. long, conspicuously white-tomentulose. Flowers rather small; calyx lobes ovate, about 2 mm. long, minutely puberulent; corolla reflexed-rotate, reddish purple or violet, the lobes 5–6 mm. long, the gynostegium sessile or subsessile, pale rose or cream, the hoods saccate, 1.5–2.0 mm. long, with very prominent marginal auricles somewhat longer than the broadly obtuse median lobe, the horn adnate about midway, linguiform, somewhat longer than the hood, the anther head truncately conic, about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, broadly fusiform, rather gradually apiculate, 6–9 cm. long, 1–2 cm. thick, minutely puberulent to glabrate, longitudinally striate; seeds oval, about 7 mm. long, the pale tawny coma 2–3 cm. long.

Sandy and rocky plains, dry flats, gullies and stream banks, spreading to fields and roadsides, often eaten by livestock on overgrazed range. Western Texas and

Fig. 88. *Asclepias brachystephana* Engelm.

southern New Mexico and Arizona; Coahuila to Sonora and southward to Guanajuato. Blooming from April to September.

UNITED STATES:

ARIZONA: Cochise, Pima, and Yavapai counties.

NEW MEXICO: Chaves, Dona Ana, Eddy, Hidalgo, Luna, Otero, Sierra, and Socorro counties.

TEXAS: Brewster, Culberson, El Paso, Hidalgo, Jeff Davis, Midland, Presidio, Randall, and Reeves counties.

MEXICO: CHIHUAHUA: Chihuahua, Escalón, Ciudad Jiménez, Santa Eulalia. COAHUILA: Saltillo, Parras, Sierra Mojada, Del Carmen, Torreón, Jimulco, Fraile, Movano, Múzquiz, Ramos Arispe, La Rosa, Hiplolito, Avalos. DURANGO: Tepehuanes, Durango, Inde, La Luz. GUANAJUATO: Guanajuato. SONORA: Llano. ZACATECAS: Cedros, Ojo Caliente.

83. ASCLEPIAS RUTHIAE Maguire, in Ann. Missouri Bot. Gard. 28:245, fig. 1. 1941. [T.: Maguire 18310, MO!]

Asclepias eastwoodiana Barneby, in Leaf. West. Bot. 4:210. 1945. [T.: Ripley & Barneby 6196, CAS!]

Small low herbaceous perennials. Stems ascending or somewhat decumbent, rather slender, simple or branching below ground, 6–9 cm. long, minutely tomentulose. Leaves opposite, petiolate, broadly ovate, apex shortly acuminate, base broadly obtuse or rounded, 1–5 cm. long, 1–3 cm. broad, glaucous, somewhat subsucculent, minutely and generally white-tomentulose, particularly the margins; petioles 2–10 mm. long. Inflorescences terminal or subterminal and occasionally lateral at the uppermost nodes, few-flowered, sessile; pedicels very slender, 1–2 cm. long, minutely tomentulose. Flowers small; calyx lobes ovate-lanceolate, about 3 mm. long, minutely tomentulose; corolla reflexed-rotate, pale violet, the lobes about 6 mm. long; gynostegium subsessile, pale rose-purple, the hoods saccate, truncate, about 1 mm. long, the horn linguiform, about as long as the hood, the anther head

Fig. 89. *Asclepias ruthiae* Maguire

truncate-conic, about 1 mm. long and 1.5 mm. broad. Follicles erect on deflexed pedicels, broadly fusiform, abruptly apiculate, 3–4 cm. long, about 1.5 cm. thick, smooth, essentially glabrous; seeds broadly oval, about 1 cm. long, the white coma about 2 cm. long.

Low alkaline clay hills and rocky slopes of pinyon pine; red sand. Utah and central Nevada. Blooming from May to June.

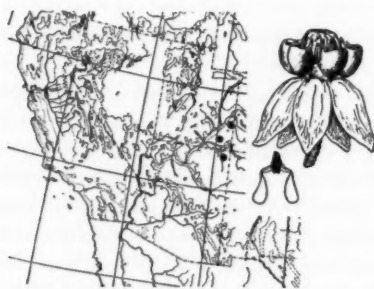
UNITED STATES:

NEVADA: Esmeralda, Lander, and Nye counties.

UTAH: Emery, San Juan, and Wayne counties.

84. *ASCLEPIAS CUTLERI* Woodson, in Ann. Missouri Bot. Gard. 26:263, fig. 2. 1939. [T.: Cutler 2177, MO!]

Small low herbaceous perennials. Stems very slender and weak, simple and branching only from the rootstalk, 6–13 cm. long, very inconspicuously puberulent.

Fig. 90. *Asclepias cutleri* Woods.

Leaves irregularly approximate, sessile, filiform, 3–8 cm. long, 1–2 mm. broad, lax, inconspicuously puberulent. Inflorescences terminal or subterminal, usually solitary, few-flowered, sessile; pedicels very slender, 5–10 mm. long, inconspicuously puberulent. Flowers small; calyx lobes lanceolate, about 3 mm. long; corolla reflexed-rotate, pale greenish rose, the lobes about 5 mm. long; gynostegium subsessile, pale rose, the hoods shortly saccate, about 1.5 mm. long, truncate but with prominent narrow marginal auricles, the horn linguiform, slightly longer

than the hood, the anther head about 1 mm. long and 1.5 mm. broad. Follicles on pendulous to weakly ascending peduncles, narrowly fusiform, rather gradually attenuate, 4–5 cm. long, about 8 mm. thick, smooth, glabrous; seeds broadly oval, about 1 cm. long, the white coma about 1.5 cm. long.

Sand dunes and gravelly places. Southern Utah and adjacent Arizona. Blooming from April to June.

UNITED STATES:

ARIZONA: Apache County.

UTAH: Grand and San Juan counties.

85. *ASCLEPIAS UNCIALIS* Greene, in Bot. Gaz. 5:64. 1880. [T.: *Greene s. n.*, MO!]

Small herbaceous perennials. Stems clustered from the rootstalk, ascending or somewhat decumbent, slender, simple, 1.5–4.0 cm. long, very inconspicuously puberulent. Leaves irregularly approximate, subsessile, heterophyllous, the lowermost ovate, abruptly grading to linear-lanceolate above, the apex acute to obtuse,

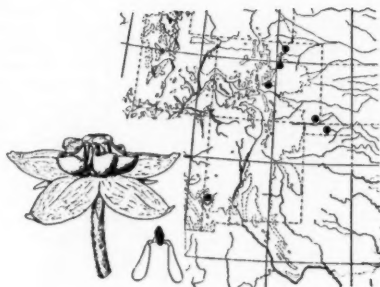


Fig. 91. *Asclepias uncialis* Greene

the base obtuse to rounded, 1–2 cm. long, 2–7 mm. broad, very minutely puberulent. Inflorescences terminal or subterminal, few-flowered, sessile; pedicels very slender, 1.0–1.5 cm. long, minutely puberulent. Flowers small; calyx lobes ovate-lanceolate, about 2 mm. long, sparsely puberulent; corolla reflexed-rotate, purplish rose, the lobes about 4 mm. long; gynostegium sessile, pale rose, the hoods very shortly saccate, about 1.5 mm. long, truncate but with prominent acute marginal auricles, the horn inflated and linguiform, slightly longer than the hood, the anther head about 1 mm. long and 1.5 mm. broad. Follicles unknown.

Sandy and rocky soil. Eastern Colorado and southwestern New Mexico. Flowering in May and June.

UNITED STATES:

COLORADO: Baca, Denver, Fremont, Texas, and Weld counties.

NEW MEXICO: Grant County.

Asclepias ruthiae, *A. cutleri*, and *A. uncialis* are an odd little constellation of satellites about *A. brachystephana*; all greatly reduced in size and scattered in their arid distributions.

86. *ASCLEPIAS CORDIFOLIA* (Benth.) Jepson, Fl. West. Middle Calif. 384. 1901.

Acerates cordifolia Benth. Pl. Hartw. 323. 1849. [T.: Hartweg 338, MO photo!]

Asclepias acornutum Kellogg, in Proc. Calif. Acad. 1:54. 1855, ex char.

Acerates atropurpurea Kellogg, loc. cit. 68. 1855. [Based on *Asclepias acornutum* Kellogg]

Gomphocarpus cordifolius (Benth.) Benth. ex A. Gray, Bot. Calif. 1:477. 1876.

Herbaceous perennials. Stems rather stout, simple, 2–8 dm. tall, frequently flattened laterally, glaucous, glabrous. Leaves opposite, rarely ternate, sessile, ovate, apex abruptly acuminate to obtuse, base broadly cordate and amplexicaul, 7–12 cm. long, 5–10 cm. broad, glabrous, glaucous, firmly membranaceous or somewhat subsucculent. Inflorescences terminal or subterminal and usually solitary or clustered at the upper nodes, rather stoutly pedunculate, several- to many-flowered, wholly glabrous; peduncles 1–7 cm. long, rarely obsolete; pedicels very slender,

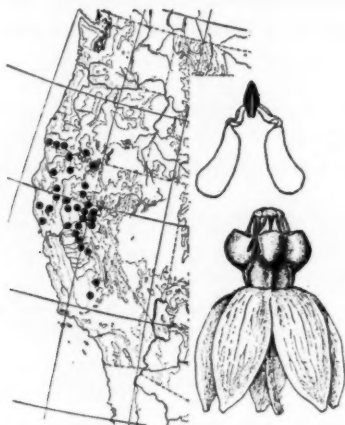


Fig. 92. *Asclepias cordifolia* (Benth.) Jepson

2–4 cm. long. Flowers rather small; calyx lobes ovate-lanceolate, about 3 mm. long, purplish, glabrous; corolla reflexed-rotate at anthesis, deep reddish purple or violet, the lobes 6–8 mm. long; gynostegium shortly stipitate, paler purple or violet, the column broadly obconic, about 1.5 mm. long and 2.5 mm. broad, the hoods saccate, about 3 mm. long, truncate but with very prominent, narrow marginal auricles, without internal horns. Follicles erect on deflexed pedicels, rather narrowly fusiform, gradually attenuate, 7–12 cm. long, about 1.5–2.0 cm. thick, glabrous; seeds broadly oval, about 8 mm. long, the white coma about 3.0–3.5 cm. long.

Talus slopes, gravelly places, upland woods and chaparral. Northern California and adjacent Oregon and Nevada. Blooming from May to July.

UNITED STATES:

CALIFORNIA: Amador, Butte, Calaveras, Eldorado, Glenn, Kern, Lake, Lassen, Mari-

posia, Modoc, Mendocino, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Sonoma, Sutter, Tulare, Tuolumne, Trinity, and Yuba counties.

NEVADA: Douglas, Ormsby, and Washoe counties.

OREGON: Curry, Jackson, Josephine, and Lake counties.

SUBGENUS V. *ACERATES* (Ell.) Woodson, stat. nov.

Acerates Ell. Sketch Bot. South Car. & Ga. 1:316. 1821. [T.: *A. longifolia* (Michx.) Ell.]

KEY TO THE SPECIES

- a. Corona with a short but definite column, the hoods much shorter than the anther head; anther wings conspicuously notched; pollinium sacs rather abruptly constricted to the translator.
 - b. Leaves ovate to ovate-elliptic; flowers reddish purple; anther head about as long as broad, the wings salient at the base. Oaxaca87. *A. vinosa*
 - bb. Leaves linear; flowers pale green frequently tinged with livid purple; anther head somewhat broader than long, the wings salient at the middle.
 - c. Inflorescences lateral, numerous, dense and nearly spherical, the flowers very slightly tinted with purple; plants relatively stout. Ohio and Tennessee westward to southern Minnesota and Oklahoma88. *A. birtella*
 - cc. Inflorescences both terminal and lateral, the lateral rather few, rather lax and hemispherical, the flowers rather liberally tinted with purple; plants rather slender. Coastal Plain: Delaware to Florida and Louisiana89. *A. longifolia*
- aa. Corona sessile, the hoods nearly as long as the anther head; anther wings not notched; pollinium sacs gradually attenuate to the translator.
 - b. Inflorescences usually lateral, numerous; anther wings salient above the middle; pollinium sacs extremely narrow and attenuate. Southern Ontario and Manitoba; Connecticut to Georgia and westward to eastern Montana and Arizona; northern Coahuila90. *A. viridiflora*
 - bb. Inflorescences terminal and solitary; anther wings salient below the middle; pollinium sacs moderately narrow and attenuate. Southern Wisconsin and northern Illinois westward to North Dakota and Kansas91. *A. nuttalliana*

87. *ASCLEPIAS vinosa* (Fourn.) Woodson, comb. nov.

Acerates vinosa Fourn. in Ann. Sci. Nat. Bot. Ser. VI, 14:387. 1882. [T.: *Gbiesbreght* 35, P!]

Low herbaceous perennials. Stems rather slender, simple or branching from the caudex, about 1.5 dm. long, inconspicuously puberulent. Leaves opposite, long-petiolate, ovate to ovate-elliptic, apex obtuse to acute, base obtuse to broadly rounded, 4–6 cm. long, 1.5–3.0 cm. broad, firmly membranaceous, inconspicuously puberulent below, glabrate above; petioles 1.0–1.5 cm. long. Inflorescences terminal, solitary, several- to rather many-flowered, shortly pedunculate; peduncle about 1.5 cm. long, minutely puberulent; pedicels slender, about 1 cm. long, minutely puberulent. Flowers rather small; calyx lobes ovate-lanceolate, about 3 mm. long, minutely and rather sparsely puberulent; corolla reflexed-rotate, dull reddish, the lobes about 6 mm. long; gynostegium very shortly but definitely

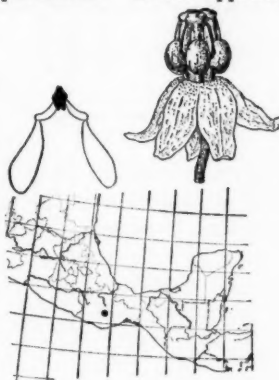


Fig. 93. *Asclepias vinosa* (Fourn.) Woods.

stipitate, reddish, the column very broadly obconic, about 1 mm. long and 1.5 mm. broad, the hoods saccate, ovoid, about 1.5 mm. long, much lower than the anther head, without a horn, the anther head truncate-conic, about 2 mm. long and 3 mm. broad. Follicles unknown.

Pine forests. Oaxaca. Blooming in June.

MEXICO: OAXACA: locality unknown.

At first glance the type specimen, which is the sole representative of the species, resembles *A. viridiflora*. But the floral structure, especially the very short hoods, is quite unlike any other species.

88. *ASCLEPIAS HIRTELLA* (Pennell) Woodson, in Ann. Missouri Bot. Gard. 28:207. 1941.

Oligoron longifolium var. *birsutum* Raf. in New Fl. North Amer. 4:60. 1838, ex char. *Acerates hirtella* Pennell, in Bull. Torrey Bot. Club 46:184. 1919. [T.: Pennell 5372, NY!]

Herbaceous perennials. Stems rather stout, simple or occasionally branching from the base, 3–10 dm. tall, rather densely pilosulose. Leaves irregularly approximate, shortly petiolate to sessile, linear-lanceolate, apex gradually acuminate, base narrowly acute, 7–16 cm. long, 0.6–1.5 cm. broad, firmly membranaceous, minutely pilosulose particularly beneath; petioles obsolete to about 8 mm. long. Inflorescences lateral and solitary at several to many of the upper nodes, shortly pedunculate, many-flowered, very dense and hemispherical; peduncles nearly obsolete to 4 cm. long, densely pilosulose; pedicels rather slender, 1.5–2.0 cm. long, densely tomentulose. Flowers rather small; calyx lobes ovate, 2–3 mm. long,

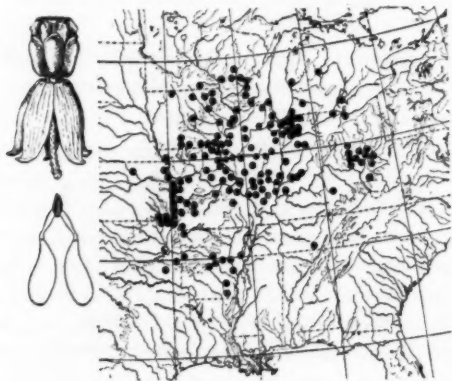


Fig. 94. *Asclepias hirtella* (Pennell) Woods.

densely and minutely pilosulose; corolla reflexed-rotate, pale green very slightly tinted with purple without, the lobes about 4–5 mm. long, gynostegium pale green, very shortly but definitely stipitate, the column about 1.5 mm. long and 1 mm. broad, the hoods deeply saccate, oblong-ovoid, about 2 mm. long, much lower than the anther head, the anther head about 1.5 mm. long and broad. Follicles erect on deflexed pedicels, rather narrowly fusiform, long-attenuate, 6–15 cm. long, about 1–2 cm. thick, very densely pilose-puberulent; seeds broadly oval, about 9 cm. long, the pale tawny coma 3.5–4.0 cm. long.

Prairies, open woods, sandy or clay soil, spreading to fields, roadsides, railways, and waste places. Southern Ontario; western West Virginia and Tennessee westward to southern Minnesota and Oklahoma. Blooming from May to September.

CANADA: ONTARIO: Essex County.

UNITED STATES:

ARKANSAS: Arkansas, Ashley, Benton, Drew, Faulkner, Izard, Lonoke, Prairie, Pulaski, Saline, Sebastian, and Saint Francis counties.

INDIANA: Cass, Clinton, Daviess, Elkhart, Fulton, Jasper, Lake, La Porte, Lawrence, Martin, Newton, Porter, Pulaski, St. Joseph, Starke, Tipton, Vandenberg, Vigo, and White counties.

IOWA: Appanoose, Black Hawk, Cerro Gordo, Chickasaw, Clinton, Davis, Decatur, Emmet, Fayette, Henry, Johnson, Lee, Ringgold, Scott, Story, Union, Van Buren, and Winnebago counties.

KANSAS: Atchison, Bourbon, Cloud, Crawford, Cherokee, Johnson, Labette, Leavenworth, Linn, Miami, and Montgomery counties.

KENTUCKY: Madison County.

ILLINOIS: Adams, Cass, Champaign, Christian, Clay, Clinton, Cook, Crawford, Cumberland, Effingham, Fayette, Franklin, Greene, Hancock, Henderson, Iroquois, Jackson, Jefferson, Jo Daviess, Kankakee, La Salle, Lawrence, McHenry, Macoupin, Marion, Peoria, Piatt, Perry, Randolph, Richland, Schuyler, Stark, Wabash, Washington, Webster, Will, Williamson, and Winnebago counties.

MICHIGAN: Bay, Berrien, Kalamazoo, and Muskegon counties.

MINNESOTA: Mower County.

MISSOURI: Adair, Boone, Cass, Cedar, Clark, Franklin, Green, Grundy, Holt, Iron, Jackson, Jasper, Lafayette, Lincoln, McDonald, Maries, Montgomery, Marion, Pike, Polk, Ralls, Randolph, St. Louis, Scotland, and Vernon counties.

OHIO: Athens, Erie, Gallia, Jackson, Lucas, Meigs, Pickaway, Pike, Ross, Scioto, and Vinton counties.

OKLAHOMA: Craig, LeFlore, Muskogee, Nowata, Ottawa, and Pushmataha counties.

TENNESSEE: Franklin County.

WEST VIRGINIA: Jackson, Lincoln, and Wood counties.

WISCONSIN: Adams, Columbia, Dane, Juneau, Kenosha, La Crosse, Marquette, Rock, and Wood counties.

Asclepias birtella and *A. longifolia* are so closely related that they might better be treated as subspecies. The ranges are quite distinct, however, and the plants look so different in the field that I must maintain them as species in spite of the very similar floral structures.

89. *ASCLEPIAS LONGIFOLIA* Michx. Fl. Bor.-Amer. 1:116. 1803, ex char.

Asclepias incarnata Walt. Fl. Carol. 106. 1788, non L., ex char.

Anthanotis procumbens Raf. Fl. Ludov. 52. 1817, ex char.

Acerates longifolia (Michx.) Ell. Sketch Bot. S. Carol. & Ga. 1:317. 1821.

Gomphocarpus longifolius (Michx.) Spreng. Syst. 1:849. 1825.

Polyotus longifolius (Michx.) Nutt. in Trans. Amer. Phil. Soc. n. s. 5:200. 1837.

Oligoron longifolium (Michx.) Raf. New Fl. North Amer. 4:60. 1838.

Acerates incarnata (Walt.) Dcne. in DC. Prodr. 8:523. 1844.

Acerates floridana (Lam.) Hitchc. in Trans. Acad. Sci. St. Louis 5:508. 1891, as to specimens cited, in part, not as to type specimen.

Acerates delticola Small, Man. Southeast. Fl. 1067. 1933. [T.: *Ingalls s. n.*, NY!]

Herbaceous perennials from a stout rather tuberous rootstalk. Stems rather slender, simple, 2-7 dm. tall, minutely pilosulose. Leaves irregularly approximate, sessile or subsessile, linear-lanceolate, gradually acuminate, the base attenuate, 6-18 cm. long, 2-10 mm. broad, minutely pilosulose to glabrate. Inflorescences terminal and solitary and lateral from few of the uppermost nodes, several- to rather many-flowered, rather lax and hemispherical, pedunculate; peduncles slender, 2-6 cm. long, rarely obsolete, minutely pilosulose; pedicels very slender, 1.5-2.0 cm. long, minutely pilosulose. Flowers small; calyx lobes lanceolate, about 2 mm. long, minutely pilosulose; corolla reflexed-rotate, pale greenish white liberally tinted with purple, particularly without, the lobes about 5 mm. long; gynostegium shortly but definitely stipitate, greenish white tinted with purple below, the column about 1.5 mm. long and 1 mm. broad, the hoods deeply saccate, obovoid, about 2 mm. long, without a horn, much lower than the anther head, the anther head about 1.5 mm.

long and broad. Follicles erect on deflexed pedicels, narrowly fusiform, long-attenuate, minutely pilosulose, 8-12 cm. long, about 1 cm. thick, seeds rather broadly oval, about 1 cm. long, the white coma about 3.5 cm. long.

Flatwoods, swamps, and low pinelands. Coastal Plain: Delaware to Florida and westward to Louisiana. Blooming from April to July.

UNITED STATES:

ALABAMA: Mobile County.

DELAWARE: Sussex County.

FLORIDA: Alachua, Collier, Dade, Duval, Flagler, Franklin, Lee, Manatee, Nassau, Pasco, Pinellas, Putnam, St. Johns, and Wakulla counties.

GEORGIA: McIntosh, Miller, and Sumter counties.

LOUISIANA: Jefferson Davis, Rapides, and St. Tammany parishes.

MISSISSIPPI: Hancock and Harrison counties.

NORTH CAROLINA: Carteret and Johnston counties.

SOUTH CAROLINA: Beaufort, Georgetown, Marion, and Sumter counties.

VIRGINIA: Greensville and Sussex counties.



Fig. 95. *Asclepias longifolia* Michx.

90. *ASCLEPIAS VIRIDIFLORA* Raf. Med. Repos. N. Y. 5:360. 1808, ex char.

Asclepias lanceolata Ives, Amer. Jour. Sci. 1:252. 1819, non Walt, ex char.

Asclepias viridiflora β *lanceolata* (Ives) Torr. Fl. North. & Mid. U. S. 1:284. 1824, ex char.

Gomphocarpus viridiflorus (Raf.) Spreng. Syst. 1:849. 1825.

Acerates viridiflora (Raf.) Pursh ex Eaton, Man. ed. 5, 90. 1829.

Polyotus heterophyllus Nutt. in Trans. Amer. Phil. Soc. n. s. 5:199. 1837, ex char. [T.: Nuttall s. n.]

Otanema lanceolata (Ives) Raf. New Fl. North Amer. 4:61. 1838.

Otanema latifolia Raf. New Fl. North Amer. 4:61. 1838, ex char.

Otanema ovata Raf. loc. cit. 1838, ex char.

Asclepias nutans Muhl. ex Steud. Nom. ed. 2, 1:146. 1841, ex char.

Acerates lanceolata Ell. ex Steud. loc. cit. 12. 1841, ex char.

Acerates viridiflora var. *lanceolata* (Ives) A. Gray, Syn. Fl. N. Amer. 2¹:99. 1878.

Acerates viridiflora var. *linearis* A. Gray, loc. cit. 1878, ex char.

Acerates viridiflora *ivesii* Britton, in Mem. Torrey Bot. Club 5:265. 1894. [Based on *Asclepias lanceolata* Ives.]

Asclepias ivesii (Britton) Woot. & Standl. in Contr. U. S. Nat. Herb. 19:509. 1905.

Acerates linearis (A. Gray) Lunell, in Amer. Midl. Nat. 4:509. 1916.

Asclepias viridiflora var. *linearis* (A. Gray) Fern. in Rhodora 48:208. 1946.

Herbaceous perennials. Stems usually rather stout, simple, rarely branching at the base, 1.5–9.0 dm. tall, inconspicuously puberulent to glabrate. Leaves opposite to irregularly approximate, shortly petiolate to sessile, extremely variable, suborbicular to linear, 4–13 cm. long, 1–6 cm. broad, firmly membranaceous, incon-

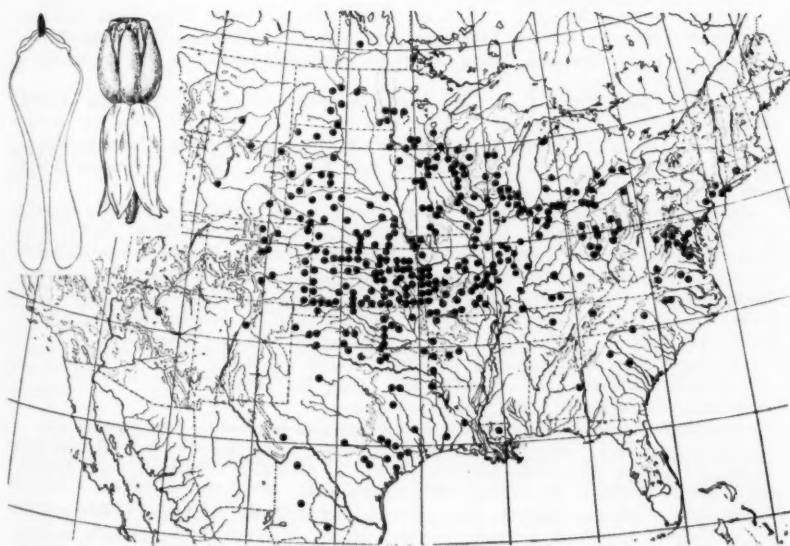


Fig. 96. *Asclepias viridiflora* Raf.

spicuously puberulent to glabrate; petioles obsolete to 1 cm. long. Inflorescences subterminal and solitary and usually lateral at few to many of the upper nodes, usually rather many-flowered, crowded and hemispherical, usually rather shortly pedunculate, puberulent; peduncles obsolete to 1.5 cm. long, rather stout; pedicels more slender, 1-2 cm. long. Flowers moderately large; calyx lobes ovate-lanceolate, 3-4 mm. long, minutely puberulent; corolla reflexed-rotate, pale green, the lobes 6-7 mm. long; gynostegium sessile, pale green, the hoods deeply saccate, oblongoid, 4-5 mm. long, nearly equalling the anther head, the anther head 3-4 mm. long. Follicles erect on deflexed pedicels, narrowly fusiform, long-attenuate, 7-15 cm. long, 1.5-2.0 cm. thick, finely puberulent to glabrate; seeds oval, 6-7 mm. long, the pale tawny coma 3-5 cm. long.

Glades, prairies, plains, and rocky or sandy hillsides, spreading to old fields and roadsides. Southern Ontario and Manitoba; Connecticut to Georgia and westward to Montana and Arizona; Coahuila. Blooming from April to August.

CANADA: MANITOBA: Norfolk County. ONTARIO: Essex, Kent, Lambton, Norfolk, and Oxford counties.

UNITED STATES:

ALABAMA: Lee County.

ARIZONA: Coconino County.

ARKANSAS: Carroll, Garland, Little River, Pope, Pulaski, and Sebastian counties.

COLORADO: Baca, Boulder, Cheyenne, Denver, El Paso, Fremont, Jefferson, Kit Carson, Larimer, Prowers, Sedgwick, Weld, and Yuma counties.

CONNECTICUT: New Haven County.

DELAWARE: New Castle County.

GEORGIA: Clarke and Richmond counties.

ILLINOIS: Adams, Boone, Carroll, Cass, Champaign, Christian, Coles, Cook, Du Page, Effingham, Hancock, Hardin, Henderson, Jo Daviess, Lake, Lee, McHenry, Macon, Macoupin, Madison, Marshall, Mason, Monroe, Peoria, Richland, St. Clair, Stark, Whiteside, and Will counties.

INDIANA: Cass, Elkhart, Fulton, Harrison, Jasper, La Grange, Lake, La Porte, Marshall, Steuben, and Tippecanoe counties.

IOWA: Benton, Black Hawk, Buchanan, Carroll, Decatur, Dickinson, Dubuque, Emmet, Fayette, Greene, Henry, Johnson, Muscatine, Palo Alto, Polk, Story, Union, and Winneshek counties.

KANSAS: Anderson, Barber, Butler, Chase, Cherokee, Cheyenne, Clay, Cloud, Comanche, Cowley, Crawford, Decatur, Dickinson, Edwards, Elk, Ellis, Ellsworth, Geary, Gove, Graham, Gray, Hamilton, Harper, Harvey, Hodgeman, Jackson, Johnson, Kingman, Kiowa, Labette, Lincoln, Linn, Lyon, McPherson, Meade, Miami, Mitchell, Montgomery, Morton, Osage, Osborne, Ottawa, Phillips, Pottawatomie, Rawlins, Reno, Republic, Rice, Riley, Rooks, Russell, Saline, Sedgwick, Seward, Shawnee, Stanton, Stevens, Sumner, Thomas, Wabauensee, Wallace, Washington, Wichita, Wilson, and Woodson counties.

KENTUCKY: Barren, Calloway, Fayette, and Warren counties.

LOUISIANA: Jefferson Davis, Rapides, and Tangipahoa parishes.

MARYLAND: Cecil and Prince Georges counties.

MICHIGAN: Jackson, Kent, Leelanau, Van Buren, and Washtenaw counties.

MINNESOTA: Becker, Blue Earth, Brown, Chippewa, Clay, Douglas, Faribault, Fillmore, Goodhue, Houston, Kandiyohi, Lincoln, Mille Lacs, Nicollet, Olmstead, Pope, Ramsey, Scott, Stearns, Wabasha, Waseca, and Winona counties.

MISSOURI: Atchison, Audrain, Barry, Barton, Bates, Boone, Buchanan, Callaway, Cass, Cedar, Cooper, Crawford, Franklin, Greene, Henry, Hickory, Holt, Howell, Jackson, Jasper, Jefferson, Lincoln, McDonald, Nodaway, Ozark, Phelps, Pulaski, Polk, Reynolds, Ste. Genevieve, St. Louis, Shannon, Washington, Wayne, and Webster counties.

MONTANA: Yellowstone County.

NEBRASKA: Antelope, Banner, Brown, Buffalo, Cedar, Chase, Cherry, Cheyenne, Custer, Dawes, Deuel, Dodge, Franklin, Garden, Hall, Jefferson, Kearney, Lancaster, McPherson, Nuckolls, Platte, Saline, Saunders, Sheridan, Sioux, and Thomas counties.

NEW JERSEY: Passaic and Somerset counties.

NEW MEXICO: Santa Fe County.

NEW YORK: Columbia, Nassau, and Richmond counties.

NORTH CAROLINA: Durham, Orange, and Rowan counties.

NORTH DAKOTA: Benson, Burleigh, Cass, McHenry, Morton, Ransom, Richland, Sioux, and Ward counties.

OHIO: Adams, Ashtabula, Athens, Clark, Coshocton, Erie, Franklin, Guernsey, Highland, Logan, Lucas, Morgan, Noble, Ottawa, Pickaway, and Pike counties.

OKLAHOMA: Beckham, Carter, Cleveland, Comanche, Creek, Custer, Grady, Greer, Johnston, Le Flore, Logan, McClain, Murray, Oklahoma, Pawnee, Payne, Roger Mills, Rogers, Texas, and Woods counties.

PENNSYLVANIA: Bucks County.

SOUTH CAROLINA: Cherokee County.

SOUTH DAKOTA: Corson, Custer, Grant, Harding, Mellette, Pennington, Perkins, Shannon, Stanley, Todd, and Washabaugh counties.

TENNESSEE: Knox and Rutherford counties.

TEXAS: Armstrong, Bastrop, Bexar, Brewster, Calhoun, Cass, Colorado, Dallas, De Witt, Fayette, Fort Bend, Garza, Hartley, Hill, Kendall, Kerr, Potter, Randall, Tarrant, Travis, Uvalde, and Walker counties.

VIRGINIA: Arlington, Campbell, Caroline, Dinwiddie, Fairfax, Fauquier, Loudoun, Prince George, Prince William, Rockbridge, Shenandoah, and Sussex counties.

WEST VIRGINIA: Berkeley, Grant, Hampshire, Jefferson, and Morgan counties.

WISCONSIN: Columbia, Dane, Dunn, Jackson, Kenosha, Portage, Rock, Sauk, Walworth, and Wood counties.

WYOMING: Crook, Fremont, Platte, and Sheridan counties.

MEXICO: COAHUILA: Sierra de San Manuel, Monclova. NUEVO LEON: Monterrey.

Although the flowers are very uniform throughout the vast range of the species, the leaves of *A. viridiflora* are tremendously variable, as is well known. A few years ago I attempted to resolve a consistent pattern from this variability, but without success. Consequently I am not attempting to divide the species into infra-specific populations which would be arbitrary rather than natural in my opinion.

91. *ASCLEPIAS NUTTALLIANA* Torr. in Ann. Lyc. N. Y. 2:218. 1828. [T.: *James s. n.*!]

Acerates nuttalliana (Torr.) Eaton, Man. ed. 5, 90. 1829.

Polyotus lanuginosus Nutt. in Trans. Amer. Phil. Soc. n. s. 5:200. 1837, ex char. [T.: *Nuttall s. n.*]

Acerates lanuginosa (Nutt.) Dcne. in DC. Prodr. 8:523. 1844.

Acerates monocephala Lapham, ex A. Gray, Man. ed. 2, Add. VI. 1857. [T.: *Lapham, s. n.*, MO!]

Low perennial herbs. Stems clustered from the rootstalk, rather slender, simple, 8–20 cm. tall, generally pilosulose. Leaves irregularly approximate, shortly petiolate to subsessile, oblong-lanceolate, apex rather abruptly obtuse or rounded, base obtuse, 4–7 cm. long, 0.7–2.2 cm. broad, firmly membranaceous, generally and rather sparsely pilosulose, particularly beneath; petioles obsolete to about 5 mm. long. Inflorescences terminal, solitary, sessile or subsessile, several- to many-flowered, pilosulose; peduncles obsolete to 3 cm. long; pedicels slender, 0.7–1.5 cm. long.

Flowers rather small; calyx lobes ovate-lanceolate, 2–3 mm. long, minutely pilose; corolla reflexed-rotate, pale greenish yellow sometimes slightly tinged with purple without, the lobes about 5 mm. long; gynostegium pale greenish, sessile, the hoods deeply saccate, oblongoid, about 3 mm. long, almost equalling the anther head, the anther head about 1.5 mm. long and 2 mm. broad. Follicles unknown.

Prairies, knobs, and sandhills, sometimes spreading to railways. Southern Wisconsin and northern Illinois westward to the Dakotas, Nebraska, and Kansas. Blooming from May to August.

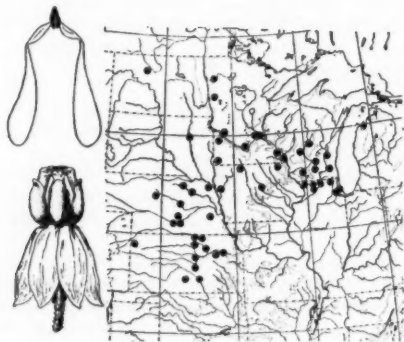


Fig. 97. *Asclepias nuttalliana* Torr.

UNITED STATES:

ILLINOIS: Boone, Cook, Du Page, Jo Daviess, McHenry, Ogle, and Winnebago counties.

IOWA: Emmet, Hardin, Winneshiek, and Woodbury counties.

KANSAS: Cloud, McPherson, Pratt, Republic, Riley, Saline, Sedgwick, Shawnee, Sherman, Wabaunsee, and Washington counties.

MINNESOTA: Chippewa, Clay, Hennepin, Houston, Nicollet, Polk, Ramsey, Rock, Winona, and Yellow Medicine counties.

NEBRASKA: Antelope, Buffalo, Dixon, Holt, Kearney, Lancaster, Phelps, Thomas, and Valley counties.

NORTH DAKOTA: Ward County.

SOUTH DAKOTA: Spink County.

WISCONSIN: Columbia, Dane, Fond du Lac, Iowa, Juneau, Portage, and Waukesha counties.

A very odd and infrequently collected species having essentially the same distribution as *A. ovalifolia* and occasionally associated with it.

SUBGENUS VI. *SOLANOA* (Greene) Woodson, stat. nov.

Schizonotus A. Gray, in Proc. Amer. Acad. 12:66. 1877, non Lindl. [T.: *S. purpurascens* A. Gray]

Solanoa Greene, Pittonia 2:67. 1890. [Based on *Schizonotus* A. Gray]

Solanoana O. Ktze. Rev. Gen. 2:421. 1891. [Based on *Solanoa* Greene]

KEY TO THE SPECIES

- a. Flowers relatively large, the corolla lobes about 1.0–1.5 cm. long; anther wings salient at the base.
 b. Plants very densely arachnoid-tomentose, relatively stout, 2–9 dm. tall; hoods not wholly adnate to the column, broadly rounded at the tip, lower than the anther head. Central and southern California92. *A. californica*
 bb. Plants essentially glabrous, relatively slender, about 1–3 dm. tall; hoods wholly adnate to the column, abruptly 2-apiculate, as tall as the anther head or somewhat taller. Western Wyoming and Colorado to eastern Oregon and California.....93. *A. cryptoceras*
 aa. Flowers relatively small, the corolla lobes about 5 mm. long; anther wings salient somewhat above the middle; hoods almost wholly adnate to the column, broadly rounded, much lower than the anther head; plants relatively slender, densely puberulent, about 1–3 dm. tall. Northern California94. *A. solanoana*

92. *ASCLEPIAS CALIFORNICA* Greene, in *Erythea* 1:92. 1893. [Based on *Acerates tomentosa* Torr.]

Acerates tomentosa Torr. Bot. Mex. Bound. Surv. 160. 1859, non *Asclepias tomentosa* Ell. [T.: Parry s. n., MO!]

Gomphocarpus tomentosus (Torr.) A. Gray, Bot. Calif. 1:477. 1876, non Burch.

Gomphocarpus torreyi Macbr. in Contr. Gray Herb. no. 65:42. 1922. [Based on *Acerates tomentosa* Torr.]

Herbaceous perennials very conspicuously white arachnoid-tomentose throughout. Stems erect, ascending, or somewhat decumbent, rather stout, simple or branching from the caudex, 2–9 dm. tall. Leaves opposite, sessile or shortly petiolate, broadly ovate or oval to elliptic-lanceolate, apex acute to obtuse, base usually broadly cordate, 4–16 cm. long, 2.5–7.0 cm. broad, firmly membranaceous,

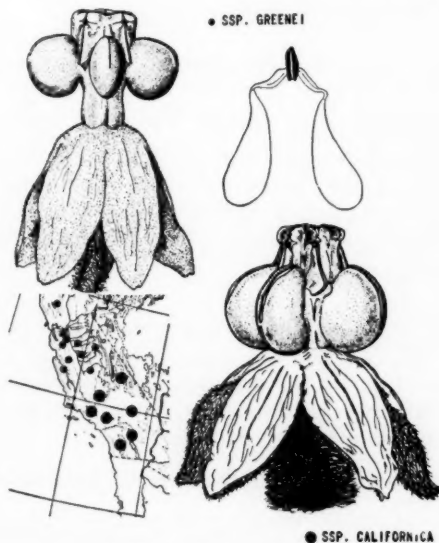


Fig. 98. *Asclepias californica* Greene

more or less glabrate in age; petioles obsolete to 2 cm. long. Inflorescences terminal or subterminal and lateral at rather few of the uppermost nodes, subsessile to definitely pedunculate, several-flowered; peduncles obsolete to 3 cm. long, relatively stout; pedicels more slender, 2–4 cm. long. Flowers rather large; calyx lobes ovate to lanceolate, about 4 mm. long, densely white-tomentulose without; corolla reflexed-rotate, purple, densely tomentulose without, the lobes 1.0–1.2 cm. long; gynostegium subsessile to definitely stipitate, purplish rose, the hoods deeply saccate, calceolate, ovoid, 4–5 mm. long, the horn very minute or absent, the anther head about 3 mm. long and 5 mm. broad. Follicles erect on deflexed pedicels, rather broadly fusiform, rather gradually apiculate, 8–10 cm. long, 2.0–2.5 cm. thick, densely white-tomentose; seeds broadly oval, about 1 cm. long, the white coma about 2 cm. long.

KEY TO THE SUBSPECIES

- Gynostegium appearing subsessile, the hoods strongly pendulous at the base. Southern California 92a. *A. californica californica*
 Gynostegium obviously stipitate, the hoods scarcely pendulous at the base. Northern California 92b. *A. californica greenii*

92a. *ASCLEPIAS CALIFORNICA* ssp. *CALIFORNICA*.

Gomphocarpus tomentosus var. *xanti* A. Gray, Bot. Calif. 1:477. 1876, ex char. [T.: *Xanthus* s. n.]

Gomphocarpus torreyi var. *xanti* (A. Gray) Macbr. in Contr. Gray Herb. no. 65:42. 1922.

Dry clearing, brushy hillsides, Mohave Desert. Southern California; Baja California. Blooming from April to July.

UNITED STATES:

CALIFORNIA: Inyo, Kern, Los Angeles, Riverside, San Bernardino, San Diego, and Ventura counties.

92b. *ASCLEPIAS CALIFORNICA* ssp. *GREENII* Woodson, subspec. nov.

A subspecies typica columna gynostegii aperta cylindrica cucullis minus saccatis differt.—Typus: A. A. Heller 8596 in Herb. Missouri Bot. Gard. ("Hall's Valley, on the Mt. Hamilton road, Santa Clara County, California, May 30, 1907").

Flats, grassy hillsides, brushy slopes, Upper Sonoran. Northern California. Blooming from April to June.

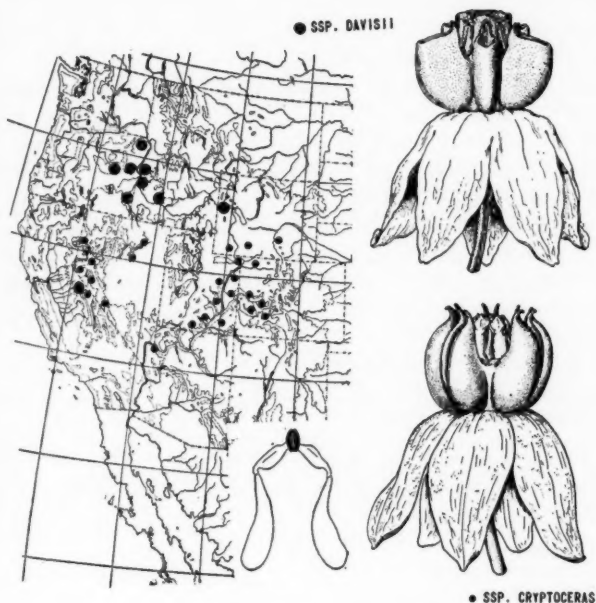
UNITED STATES:

CALIFORNIA: Alameda, Contra Costa, Fresno, Lake, Mariposa, Merced, Monterey, San Benito, Santa Clara, and Stanislaus counties.

These subspecies intergrade to some extent, and the differences which separate them are rather technical. However, they certainly are of importance phylogenetically and should be named as populations.

93. *ASCLEPIAS CRYPTOCERAS* S. Wats. Bot. King's Exped. 283, t. 28. 1871. [T.: *Nuttall* s. n., NY!]

Decumbent herbaceous perennials. Stems clustered from the base, somewhat stout, more or less ancipitous or flattened, simple or branching from the very base, 1–3 dm. long, glabrous or essentially so. Leaves opposite, shortly petiolate, very

Fig. 99. *Asclepias cryptoceras* S. Wats.

broadly oval or ovate, suborbicular, apex broadly rounded to very broadly obtuse; base broadly rounded to very slightly cordate, 4–9 cm. long, 4–8 cm. broad, glaucous, glabrous; petioles nearly obsolete to 5 mm. long. Inflorescences terminal and frequently lateral at the uppermost nodes, the lateral sessile, rather few- to several-flowered; peduncles obsolete to 7 cm. long when terminal; pedicels slender, 2–4 cm. long, glabrous. Flowers large; calyx lobes narrowly lanceolate, 6–7 mm. long, glabrous; corolla reflexed-rotate, greenish yellow, the lobes 1.0–1.5 cm. long; gynostegium sessile, pale rose, the hoods deeply saccate and decurrent upon the column, conspicuously 2-apiculate, 6–9 mm. long, equalling the anther head or somewhat longer, the horn very inconspicuous and incurved or absent, the anther head 3.0–3.5 mm. long and 4–5 mm. broad. Follicles erect on erect pedicels, broadly fusiform, rather shortly apiculate, 4–7 cm. long, 1.5–2.5 cm. broad, smooth, glabrous; seeds broadly oval, about 1 cm. long, the pale tawny coma 1.5–2.5 cm. long.

KEY TO THE SUBSPECIES

- Hoods oblong-ovoid, gradually rounded to the tips, usually somewhat surpassing the anther head. Western Colorado, Utah, and adjacent Wyoming, Arizona, and eastern California.....93a. *A. cryptoceras cryptoceras*
 Hoods subrhombic, truncate to the tips, usually somewhat shorter than the anther head. Southern Idaho and adjacent Wyoming, Oregon, and California.....93b. *A. cryptoceras davisii*

The differences between these two subspecies are similar to those of *A. vestita* and *A. californica*: the extremes so distinct in floral structures as to be interpreted as species, but with geographical intergradation.

Watson's original sheet of *A. cryptoceras* bears four different collections: one collected by Watson from the "W. Humboldt Mtns., Nev." and one from "Idaho, Rev. R. D. Nevins, 1876", both of which are ssp. *davisii*; one from Glenwood, Utah, collected in May, 1875 by L. F. Ward in fruit, and one collected by Nuttall on "Ham's Fork of the . . . [Green River, Utah]" are ssp. *cryptoceras*. In proposing *A. cryptoceras* Watson cites the Nuttall specimen first, secondly a specimen collected by Fremont (584) in southeastern Idaho (which is not represented), and thirdly the Watson specimen. I am choosing the Nuttall specimen as the lectotype. The highly formalized drawing is rather a composite of both subspecies.

93a. *ASCLEPIAS CRYPTOCERAS* ssp. *CRYPTOCERAS*.

Acerates latifolia Torr. & Frem. in Rept. Frem. Exped. 317. 1845, non *Asclepias latifolia* Raf. [T.: Fremont s. n., NY!]

Loose shaly, sandy, and clay hillsides, bottoms of washes and canyons, arid plains. Western Colorado, Utah, and adjacent Wyoming, Arizona, and California. Blooming from April to June.

UNITED STATES:

ARIZONA: Mohave County.

CALIFORNIA: Mono County.

COLORADO: Delta, Mesa, Moffat, Montrose, and Ouray counties.

NEVADA: Churchill, Douglas, Elko, Esmeralda, Eureka, Humboldt, Lyon, Mineral, and Washoe counties.

UTAH: Carbon, Daggett, Emery, Garfield, Grand, Kane, San Juan, and Uintah counties.

WYOMING: Carbon, Sweetwater, and Uinta counties.

93b. *ASCLEPIAS CRYPTOCERAS* ssp. *davisii* (Woodson) Woodson, stat. nov.

Asclepias davisii Woodson, in Ann. Missouri Bot. Gard. 26:261, fig. 1. 1939. [T.: Davis 85, MO!]

Barren clay knolls, loose shale and lava hillsides. Southern Idaho and adjacent Wyoming, Oregon, and California.

UNITED STATES:

CALIFORNIA: Mono County.

IDAHO: Canyon, Elmore, and Washington counties.

OREGON: Baker, Grant, Malheur, and Wallowa counties.

WYOMING: Lincoln County.

94. *ASCLEPIAS SOLANOANA* Woodson, in Ann. Missouri Bot. Gard. 28:207. 1941.

[Based on *Gomphocarpus purpurascens* A. Gray, non Rich.]

Gomphocarpus purpurascens A. Gray, in Proc. Amer. Acad. 10:76. 1874, non A. Rich. [T.: Towle s. n., GH!]

Schizonotus purpurascens (A. Gray) A. Gray, loc. cit. 12:66. 1877.

Solanoa purpurascens (A. Gray) Greene, Pittonia 2:67. 1890.

Solanoana purpurascens (A. Gray) O. Ktze. Rev. Gen. 2:421. 1891.

Prostrate herbaceous perennials. Stems relatively slender, simple, 1.0–2.5 dm. long, densely and minutely puberulent. Leaves opposite, petiolate, broadly ovate or oval, apex broadly obtuse or rounded, base truncate to broadly cordate, 3–4 cm. long, 2.5–3.0 cm. broad, firmly membranaceous or somewhat succulent, densely and minutely puberulent particularly below; petioles 0.5–2.0 cm. long. Inflorescences terminal or subterminal, solitary or lateral also at the uppermost nodes, many-flowered, pedunculate, densely and minutely puberulent; peduncles 1.5–4.5 cm. long; pedicels 1.0–1.5 cm. long. Flowers small; calyx lobes narrowly lanceolate, about 3 mm. long, very minutely puberulent; corolla reflexed-rotate, purple, the lobes about 6 mm. long; gynostegium sessile, cream, the hoods almost wholly

adnate to the column, completely bifid dorsally, rhombic-ovoid, about 2–3 mm. long, inserted below the anther head, the horn absent, the anther head about 1.5 mm. long and broad. Follicles erect on deflexed pedicels, rather narrowly fusiform, gradually apiculate, about 10 cm. long and 0.5 cm. thick; seeds unknown.

Open woods, rocky slopes on serpentine. Northern California. Blooming in June.

UNITED STATES:

CALIFORNIA: Colusa, Sonoma, and Trinity counties.



Fig. 100. *Asclepias solanoana* Woods.

SUBGENUS VII. POLYOTUS (Nutt.) Woodson, stat. nov.

Polyotus Nutt. in Trans. Amer. Phil. Soc. n. s. 5:199. 1837. [T.: *P. angustifolius* Nutt.]

KEY TO THE SPECIES

- a. Leaves rather strictly ascending; hoods about as long as the anther head, deeply 2-lobed, the wholly adnate crest forming a third, median lobe; anther wings very prominently spurred toward the base; follicles erect on erect pedicels. Southwestern Missouri westward to South Dakota, eastern Colorado, and northern Texas.....95. *A. stenophylla*
 - aa. Leaves widely spreading to somewhat reflexed; hoods shorter than the anther head, broadly emarginate to essentially entire.
 - b. Anther head truncate-conic, the wings definitely salient and conspicuously spurred at the base; hoods with a minute horn or crest toward the base. Arizona and adjacent Utah96. *A. rusbyi*
 - bb. Anther head depressed-spheric, the wings rather symmetrically arcuate and not spurred at the base; hoods without a horn or crest; follicles erect on deflexed pedicels. Nebraska to Texas and westward to southern Arizona; northern Coahuila.....97. *A. engelmanniana*
95. ASCLEPIAS STENOPHYLLA A. Gray, in Proc. Amer. Acad. 12:72. 1877. [Based on *Polyotus angustifolius* Nutt.]
- Polyotus angustifolius* Nutt. in Trans. Amer. Phil. Soc. n. s. 5:201. 1837, nec *Asclepias angustifolia* Schweig. nec alior. [T.: *Nuttall s. n.*, MO photo!]
- Acerates angustifolia* (Nutt.) Dcne. in DC. Prodr. 8:522. 1844.

Herbaceous perennials from subnapiform tuberous rootstalks. Stems rather slender, simple, 2-8 dm. tall, very minutely puberulent to glabrate. Leaves irregularly approximate, sessile, linear, 6-14 cm. long, 2-4 mm. broad, rather strictly ascending, firmly membranaceous, very minutely and scatteringly puberulent to glabrate. Inflorescences lateral at few to several of the uppermost nodes, several-flowered, subsessile to very shortly pedunculate; peduncles obsolete to 1 cm. long, minutely puberulent; pedicels very slender, 5-8 mm. long, minutely puberulent. Flowers rather small; calyx lobes lanceolate, about 2-3 mm. long, minutely puberulent; corolla rotate, pale greenish white or yellow, the lobes about 6 mm. long; gynostegium sessile, pale greenish cream or white, the hoods saccate and strongly adnate to the column, conspicuously excurrent-auriculate at the base, oblong-elliptic, 3-4 mm. long, the tip deeply 2-lobed, the wholly adnate horn or crest forming a third, lower, median lobe, the anther head broadly truncate-conic, about 2 mm. long and broad. Follicles erect on erect pedicels, very narrowly fusiform and gradually attenuate, 9-12 cm. long, about 7-8 mm. thick, minutely pilosulose to glabrate; seeds oval, 5-6 mm. long, the pale tawny coma 3.0-3.5 cm. long.

Prairies and limestone glades. Southwestern Missouri westward to South Dakota, eastern Colorado, and northern Texas. Blooming from June to August.

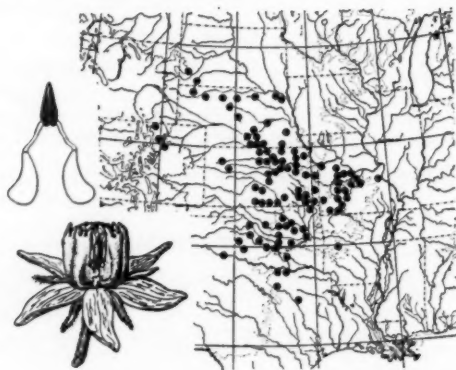


Fig. 101. *Asclepias stenophylla* A. Gray

UNITED STATES:

ARKANSAS: Yell County.

COLORADO: Boulder, Denver, and Larimer counties.

KANSAS: Atchison, Barber, Bourbon, Cherokee, Clay, Cowley, Dickinson, Elk, Ellsworth, Franklin, Geary, Gove, Harper, Jackson, Jewell, Labette, Lincoln, McPherson, Miami, Mitchell, Morris, Nemaha, Neosho, Osage, Osborne, Reno, Republic, Rice, Riley, Rooks, Russell, Saline, Shawnee, Smith, Stafford, Sumner, Thomas, Wabaunsee, Washington, Wilson, and Woodson counties.

MISSOURI: Barry, Benton, Christian, Cole, Dallas, Greene, Hickory, Jackson, Jasper, Jefferson, Maries, Morgan, Pettis, Phelps, Polk, Pulaski, Stone, and Webster counties.

NEBRASKA: Brown, Buffalo, Cedar, Cherry, Custer, Dawes, Dixon, Franklin, Holt, Jefferson, Kearney, Lancaster, Merrick, Nuckolls, Phelps, Sheridan, Thomas, and Webster counties.

OKLAHOMA: Beckham, Caddo, Cleveland, Comanche, Craig, Creek, Custer, Dewey, Grady, Greer, Johnston, Kingfisher, Logan, McClain, Muskogee, Noble, Oklahoma, Pawnee, Payne, Seminole, and Wagoner counties.

SOUTH DAKOTA: Custer and Shannon counties.

TEXAS: Cooke, Grayson, Hall, Henderson, and Tarrant counties.

Asclepias stenophylla long has been prominent as a "link" between the genera *Asclepias* (*sensu stricto*) and *Acerates* (*sensu lato*), because of its saccate hoods with their obvious crests or horns. The combination of these characters is repeated periodically throughout the inclusive genus *Asclepias* and renders them particularly useless in the segregation of natural genera.

96. *ASCLEPIAS rusbyi* (Vail) Woodson, comb. nov.

Acerates rusbyi Vail, in Bull. Torrey Bot. Club 25:37. 1898. [T.: *Rusby s. n.*, NY!]

Asclepias engelmanniana var. *rusbyi* (Vail) Kearney, in Leaflet West. Bot. 5:197. 1949.

Herbaceous perennials. Stems rather slender, simple, glaucous, glabrous. Leaves irregularly approximate, sessile, linear, 9–15 cm. long, 3–7 mm. broad, somewhat subsucculent, glaucous, glabrous, laxly spreading to reflexed, more or less conduplicate. Inflorescences lateral from few to several of the upper nodes, several- to rather many-flowered, subsessile to shortly pedunculate; peduncles obsolete to 1.5 cm. long, glabrous or essentially so; pedicels slender, about 1 cm. long, inconspicuously pilosulose. Flowers rather small; calyx lobes ovate-lanceolate, about 3–4 mm. long, minutely and rather irregularly pilosulose; corolla rotate, pale green usually somewhat tinted with purple without, the lobes 5–6 mm. long; gynostegium sessile or subsessile, pale green somewhat tinted with purple, the hoods deeply saccate and excurrently auriculate at the base, 2.0–2.5 mm. long, truncate, with an inconspicuous adnate crest of about equal length, the anther head truncately conic, about 3 mm. long and broad. Follicles unknown.

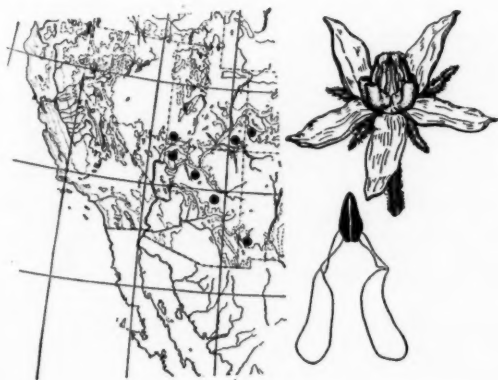


Fig. 102. *Asclepias rusbyi* (Vail) Woods.

Rocky slopes in open oak forest. Northern Arizona and adjacent Utah. Blooming in June and July.

UNITED STATES:

ARIZONA: Coconino, Gila, and Mohave counties.

UTAH: San Juan and Washington counties.

When I first examined the type specimen of *A. rusbyi*, I fancied that it might represent a hybrid between *A. engelmanniana* and *A. stenophylla*, because of a combination of resemblances to those species. This can scarcely be the case, however, since it is far outside the present range of *A. stenophylla*. Another possible interpretation is that it is a subspecies of *A. engelmanniana*, which is essentially Kearney's position. I am rather reluctantly assigning it to full status as a species because there are several, not merely one or at best a few, structural differences of the flowers, and because the population occurs well within the range of *A. engelmanniana*.

97. *ASCLEPIAS ENGELMANNIANA* Woodson, in Ann. Missouri Bot. Gard. 28:207. 1941. [Based on *Acerates auriculata* Engelm.]

Acerates auriculata Engelm. in Torr. Rept. Bot. Mex. Bound. Surv. 160. 1839. [T.: Bigelow s. n., US!]

Asclepias auriculata (Engelm.) Holzinger, in Bot. Gaz. 17:125, 160. 1892, non HBK.

Gomphocarpus auriculatus (Engelm.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²:236. 1895.

Herbaceous perennials. Stems rather stout, simple or branching infrequently from the caudex, 6–12 dm. tall, glabrous or essentially so. Leaves irregularly approximate, sessile, linear, 12–18 cm. long, 1.5–3.0 mm. broad, rather laxly spreading or reflexed, more or less canaliculate, firmly membranaceous or somewhat subsucculent, glabrous. Inflorescences lateral from several to many of the upper nodes, many-flowered and very crowded, subsessile to shortly pedunculate; peduncles



Fig. 103. *Asclepias engelmanniana* Woods.

obsolete to about 2 cm. long, relatively stout, very inconspicuously appressed-puberulent; pedicels rather slender, about 1 cm. long, inconspicuously appressed-puberulent. Flowers rather small; calyx lobes ovate-lanceolate, about 3 mm. long, essentially glabrous; corolla reflexed-rotate, pale green more or less flushed with purple without, the lobes about 5 mm. long; gynostegium sessile, the hoods deeply saccate and excurrently auriculate at the base, broadly truncate or broadly retuse at the tip, about 3 mm. long, without a horn, the anther head depressed-spheric, about 2.5 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, narrowly fusiform, gradually attenuate, 8–12 cm. long, about 1.5 cm. thick; seeds oval, about 7 mm. long, the pale tawny coma about 3 cm. long.

Prairies and swales, open sandy hillsides, draws, washes, and bottoms. Nebraska to Texas and westward to Arizona; Coahuila. Blooming from July to September.

UNITED STATES:

ARIZONA: Gila and Santa Cruz counties.

COLORADO: Arapahoe, Archuleta, Baca, Boulder, Cheyenne, Denver, El Paso, Fremont, Jefferson, Larimer, Montezuma, Montrose, Otero, Prowers, Pueblo, Teller, and Yuma counties.

KANSAS: Anderson, Cheyenne, Cloud, Comanche, Cowley, Ellis, Finney, Ford, Gove, Graham, Greeley, Hamilton, Harvey, Hodgeman, Kearney, Kiowa, Logan, Morton, Norton, Osborne, Rooks, Russell, Sedgwick, Sheridan, Sherman, Smith, Stafford, Stanton, Stevens, Sumner, Trego, and Wallace counties.

NEBRASKA: Banner, Deuel, Dundy, Lincoln, Platte, and Thomas counties.

NEW MEXICO: Chaves, De Baca, Grant, and Lincoln counties.

OKLAHOMA: Blaine, Custer, Cimarron, Kingfisher, Major, Ottawa, Payne, Roger Mills, and Woods counties.

TEXAS: Brewster, Collin, Comal, Culberson, Garza, Hartley, Irion, Lubbock, Martin, Oldham, Palo Pinto, Pecos, Randall, Somervell, Scurry, Tom Green, and Uvalde counties.

MEXICO: COAHUILA: Múzquiz, Santa Rosa Mtns.

The anther head of *A. engelmanniana* is most unique: depressed-spheric with the broadly lunate anther wings nearly describing its circumference and the large glands of the translators virtually meeting at the summit.

SUBGENUS VIII. ASCLEPIODORA (A. Gray) Woodson, stat. nov.

Asclepiodora A. Gray, in Proc. Amer. Acad. 12:66. 1877. [T.: *A. viridis* (Walt.) A. Gray]

KEY TO THE SPECIES

- a. Corolla lobes at length reflexed; hoods only slightly deflexed from the anther head; leaves opposite, deeply cordate, sessile and amplexicaul. Southwestern Texas and southern New Mexico and Arizona; Nuevo Leon to Sonora and southward to Chiapas; Guatemala98. *A. elata*
- aa. Corolla lobes spreading or somewhat ascending at the tips; hoods sharply deflexed from the anther head.
 - b. Leaves opposite; inflorescences lateral to subterminal.
 - c. Leaves broadly ovate-elliptic, deeply cordate and amplexicaul; corolla greenish white or yellow. Chihuahua99. *A. mirifica*
 - cc. Leaves linear-lanceolate to filiform, attenuate at the base; corolla usually strongly suffused with reddish purple.
 - d. Plants herbaceous, branching infrequently; leaves rather long, linear to linear-lanceolate; inflorescences several-flowered; obviously pedunculate.

- e. Hoods with conspicuous sharply ascending tips about as long as the anther head. Hidalgo and Mexico westward to Jalisco100. *A. fourieri*
- ee. Hoods reduced to the deflexed base, without conspicuous ascending tips. Nuevo Leon and Coahuila101. *A. zanthodacryon*
- dd. Plants suffruticose, branching repeatedly and rather fastigiately; leaves rather short, filiform; inflorescences 1-flowered, without a peduncle. Southwestern Texas102. *A. sperryi*
- bb. Leaves irregularly approximate; inflorescences terminal.
- c. Hoods less than half as long as the corolla lobes; anther head about as long as broad, the wings very narrow and inconspicuous. Tennessee to Florida and westward to Nebraska and eastern Texas103. *A. viridis*
- cc. Hoods almost as long as the corolla lobes; anther head much broader than long, the wings very broad and conspicuous. Southern Kansas to Texas and westward to Arizona and adjacent Nevada and California; Tamaulipas to Chihuahua and southward to Hidalgo104. *A. asperula*
98. *ASCLEPIAS ELATA* Benth. Pl. Hartw. 290. 1848. [T.: Hartweg s. n., K!]
- Asclepias glaucescens* var. *elata* (Benth.) Fourn. in Ann. Sci. Nat. Bot. Ser. VI, 14:382. 1882.
- Asclepias macronra* A. Gray, in Proc. Amer. Acad. 22:436. 1887. [T.: E. Palmer 344, GH!]

Herbaceous perennials. Stems rather stout, simple, 3-7 dm. tall, glabrous, glaucous. Leaves opposite, sessile, very broadly oval to oblong, apex very broadly obtuse to rounded, base broadly cordate, 7-14 cm. long, 2.5-7.0 cm. broad, glabrous, very glaucous. Inflorescences terminal or subterminal and usually lateral from few of the uppermost nodes, several- to rather many-flowered, rather long-pedunculate; peduncles relatively stout, glabrous or very inconspicuously pilosulose in opposed lines; pedicels more slender, 1.5-3.0 cm. long, densely white-tomentu-

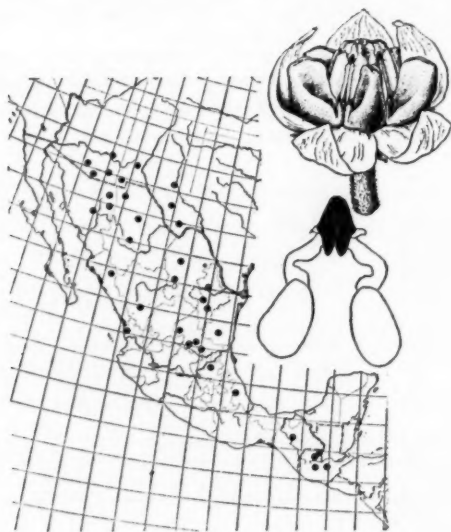


Fig. 104. *Asclepias elata* Benth.

lose. Flowers rather large; calyx lobes ovate, 3–4 mm. long; corolla pale green or greenish white, the lobes 8–12 mm. long; gynostegium sessile, greenish white to cream, the hoods saccate at the base, compressed-rhomboid, 4–6 mm. long, truncate, somewhat deflexed from the anther head, the crest wholly adnate and about as long as the hood, the anther head broadly truncate-conic, about 3 mm. long and 4 mm. broad. Follicles erect on deflexed pedicels, fusiform, rather narrowly apiculate, 8–12 cm. long, 1.0–2.5 cm. thick, smooth, very inconspicuously pilosulose to glabrate; seeds oval, about 7 mm. long, the pale tawny coma 2.5–4.5 cm. long.

Dry rocky slopes in open pine, juniper, or oak woods, spreading to pastures, cultivated fields, and along railways. Southwestern Texas and southern New Mexico and Arizona; Nuevo Leon to Sonora and southward to Chiapas; Guatemala. Blooming from June to September.

UNITED STATES:

ARIZONA: Cochise, Graham, Pima, and Santa Cruz counties.

NEW MEXICO: Eddy, Hidalgo, and Sierra counties.

TEXAS: Brewster and Jeff Davis counties.

MEXICO: CHIAPAS: locality unknown. CHIHUAHUA: Janos, Carretas, Cusi, Chihuahua. COAHUILA: Santa Rosa Mts., Parras. DURANGO: Otinapa. HIDALGO: Jacala. NAYARIT: Tepic. NUEVO LEÓN: Galeana, Saltillo, Dulces Nombres. SONORA: Bavispe, Las Cuevas, Aribabi. SINALOA: Sierra Surotato. TAMAULIPAS: Jaumave. SAN LUIS POTOSÍ: Morales, San Luis Potosí, Minas de San Rafael, Bagre. VERACRUZ: Orizaba.

GUATEMALA: HUEHUETENAGO: Huehuetenango, San Sebastián H. JALAPA: Fiscal. SOLOLA: San Pedro.

The distinction between *A. glaucescens* and *A. elata* long has been very obscure, and some authors have considered them as a single species. I have come to the conclusion that they are quite distinct, although capable of hybridization. When not in flower, the two are virtually indistinguishable, and under such conditions, in fact, the two might also be indistinguishable from other species such as *A. mirifica* or even *A. grandiflora*.

In flower, however, many differences are observable, such as the apparent column and the conspicuously exerted corona horns of *A. glaucescens*, and the sessile gynostegium and poorly developed horns of *A. elata*. According to my observations, the two species are not referable even to the same subgenera: *glaucescens* to subgen. ASCLEPIAS series GRANDIFLORAE because of the substipitate hoods and relatively narrow anther head, and *elata* to subgen. ASCLEPIODORA because the hoods are quite sessile and saccate at the base. An additional differentium is found in the translators of the two species: those of *elata* bearing two hyaline appendages from the gland just above the attachment of the translator arms, whilst such appendages are lacking in *A. glaucescens*.

As happens with embarrassing frequency in my system of *Asclepias*, however, *A. glaucescens* and *A. elata* appear to hybridize occasionally none the less, and such individuals are represented in my opinion by Gray's *A. macroura*. In interpreting such putative hybrids, one is grateful for the hyaline translator appendages of *A. elata*! Perhaps it would be better to abandon the rather fine structural distinctions

which I have tried to draw between my subgenera and series, and to classify both *A. glaucescens* and *A. elata* with the species of series ROSEAE of subgenus ASCLEPIAS. Such a course, however, would immediately submerge the distinction of *Asclepiodora* even as a subgenus, and concomitant erosion of the other subgenera and series would reduce the whole to the rather amorphous genetic reticulum, which apparently it is in fact.

99. *ASCLEPIAS mirifica* Woodson, spec. nov.

Herbae perennes ca. 1 m. altae omnino glaucescentes pedicellis exceptis glabrae. Caules validi simplices. Folia opposita sessilia ovata vel ovato-elliptica apice obtusa vel late acuta basi late cordata ibique valde amplexicaulia 7–10 cm. longa 4–5 cm. lata. Inflorescentiae e nodis pluribus laterales pluriflorae longe pedunculatae; pedunculis validiusculis, 9–10 cm. longis; pedicellis graciliusculis 2–3 cm. longis sparse pilosulis. Flores magni; calycis laciniis ovatis ca. 9 mm. longis glabris purpureis; corolla rotata pallide gilva, lobis ca. 1.5 cm. longis patulis; gynostegio sessile lacteo, cucullis a gynostegio valde deflexis late subfalcatis basi saccatis ca. 6 mm. longis, crista humili vix aperta, androecio late subcylindrico ca. 4.5 mm. longo 6 mm. lato. Folliculi mihi ignoti.—Holotypus: *H. S. Gentry 2352* in Herb. Chicago Nat. Hist. Mus. ("Guasaremos, Río Mayo, Chihuahua, Mexico, infrequent herb of the cool mountain slopes, about a meter high; Upper Sonoran; oak slope; July 30, 1936.").

I could choose an even more dramatic epithet to describe my horror when the nature of this strange plant finally dawned upon me, for I had at first assigned it to *A. elata*, as the general appearance would suggest. The flowers are totally different, as the key and description convey; close relationship to *elata* is implied by

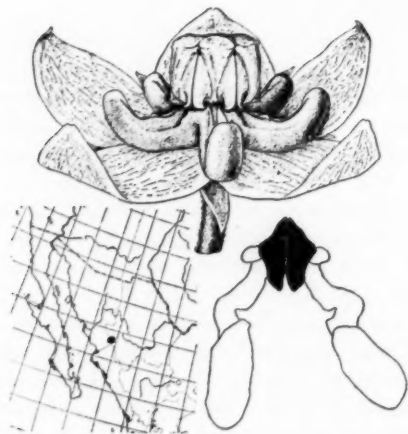


Fig. 105. *Asclepias mirifica* Woods.

the massive translator arms of the pollinia with their hyaline appendages so reminiscent of those of the latter species. If *A. mirifica* were represented by many sheets from a wide range, I would probably classify *A. elata* as a hybrid swarm between *A. mirifica* and *A. glaucescens*!

100. *ASCLEPIAS FOURNIERI* Woodson, in Ann. Missouri Bot. Gard. 28:207. [April 28] 1941. [Based on *Acerates gomphocarpoides* Dcne.]

Acerates gomphocarpoides Dcne. in Ann. Sci. Nat. Ser. II, 9:323. 1838, non *Asclepias gomphocarpoides* Schltr. [T.: *Andrieux* 235, P!]

Asclepiodora gomphocarpoides (Dcne.) Fourn. loc. cit. Ser. VI, 14:1882.

Gomphocarpus palmeri A. Gray, in Proc. Amer. Acad. 22:436. 1887, non *Asclepias palmeri* Vail. [T.: E. Palmer 21, GH!]

Blepharodon gomphocarpoides (Dcne.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²:243. 1895.

Asclepias grayi L. Benson, in Amer. Jour. Bot. 28:363. [June 4] 1941. [Based on *Gomphocarpus palmeri* A. Gray.]

Low herbaceous perennials from a tuberous subfusiform rootstalk. Stems relatively slender, simple or branching rather frequently, 6–30 cm. tall, minutely and densely puberulent. Leaves opposite, sessile, linear, 4–15 cm. long, 3–6 mm. broad, membranaceous, minutely tomentulose particularly beneath, glabrate above. Inflorescences subterminal and lateral from few to several of the uppermost nodes, few- to several-flowered, pedunculate; peduncles rather slender, 5–7 cm. long,

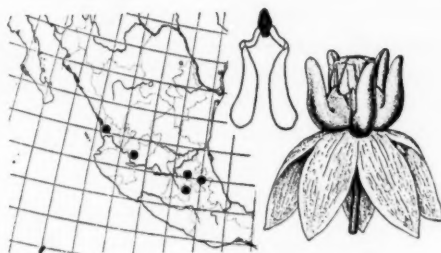


Fig. 106. *Asclepias fournieri* Woods.

minutely puberulent; pedicels very slender, about 1 cm. long, minutely puberulent. Flowers mediocre; calyx lobes ovate-lanceolate, very minutely puberulent; corolla rotate, reddish purple, somewhat puberulent without, the lobes 5–7 mm. long; gynostegium sessile, reddish purple, the hoods strongly deflexed from the anther head but with conspicuously ascending oblong tips about as long as the anther head, about 5 mm. long, the anther head truncate-conic, about 2 mm. long and 3 mm. broad. Follicles erect on deflexed pedicels, very narrowly fusiform, gradually attenuate, 8–10 cm. long, about 5 mm. thick, minutely puberulent to glabrate; seeds unknown.

Dry hillsides. Hidalgo and Mexico westward to Jalisco. Blooming from April to August.

MEXICO: HIDALGO: Huasca. JALISCO: Río Blanco, Guadalajara. MEXICO: Toluca, Ixtlahuaca. NAYARIT: Tepic.

101. *ASCLEPIAS ZANTHODACRYON* (L. B. Smith) Woodson, in Ann. Missouri Bot. Gard. 28:207. 1941.

Asclepiodora zanthodacryon L. B. Smith, in Contr. Gray Herb. no. 114:12. 1936. [T.: Mueller & Mueller 816, GH!]

Low herbaceous perennials from rather fusiform tuberous rootstalks. Stems rather slender, simple or branching from the caudex, 1-4 dm. tall, minutely pilosulose. Leaves opposite, sessile or subsessile, linear to linear-lanceolate, 4-15 cm. long, 1.5-4.0 mm. broad, membranaceous, very sparsely and minutely pilosulose to essentially glabrous. Inflorescences subterminal and solitary or also lateral from few of the uppermost nodes, few- to several-flowered, pedunculate; peduncles rather slender, 3-5 cm. long, minutely pilosulose; pedicels slender, 1.0-1.5 cm. long, minutely and densely puberulent. Flowers rather large; calyx lobes ovate-lanceolate, about 5 mm. long; corolla rotate, reddish purple or violet, the lobes 1.0-1.2 cm. long; gynostegium sessile, yellowish or pinkish cream, the hoods reduced to the broad, deflexed base, about 5 mm. long, the crest indefinite, the anther head very broadly subcylindric, about 2 mm. long and 3 mm. broad. Follicles unknown.

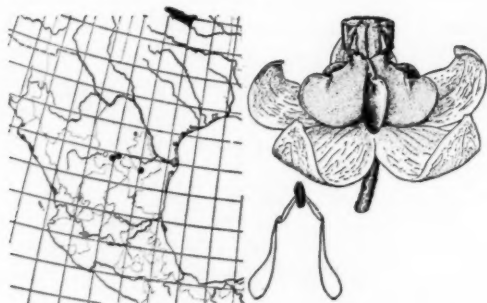


Fig. 107. *Asclepias zanthodacryon* (L. B. Smith) Woods.

Hillsides in pine or oak woods. Nuevo Leon and Coahuila. Blooming from May to July.

MEXICO: COAHUILA: Sierra de Parras. NUEVO LEÓN: Galeana.

102. *ASCLEPIAS SPERRYI* Woodson, in Ann. Missouri Bot. Gard. 28:246, fig. 2. 1941. [T.: Sperry T553, MO!]

Low suffruticose perennials. Stems clustered from the rootstalk and branching repeatedly and rather fastigiately, very slender, 1-3 dm. tall, very minutely puberulent to essentially glabrous. Leaves opposite, sessile, filiform, 6-8 cm. long, about 1 mm. broad, revolute, glabrous. Inflorescences lateral at few of the uppermost nodes, sessile, 1- (or very rarely 2-) flowered; pedicels filiform, about 5 mm. long,

glabrous. Flowers rather small; calyx lobes ovate, about 2 mm. long; corolla rotate, pale greenish yellow more or less tinged with purple without, the lobes about 5 mm. long; gynostegium sessile, pale greenish yellow or white occasionally somewhat tinted with purple, the hoods tubiform, about 4 mm. long, the base abruptly deflexed from the anther head thence with ascending broadly expanded tips, the crest wholly adnate, low, the anther head very broadly cylindric, about 1 mm. long and 2.5 mm. broad. Follicles erect on deflexed pedicels, very narrowly fusiform, gradually attenuate, 5–7 cm. long, about 4 mm. thick, smooth, glabrous; seeds oval, about 5 mm. long, the white coma about 2.5 cm. long.

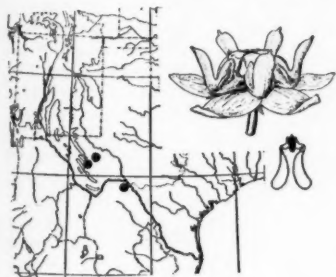


Fig. 108. *Asclepias sperryi* Woods.

Limestone ledges and slopes, open places among grass. Southwestern Texas; northern Coahuila. Blooming from April to August.

UNITED STATES:

TEXAS: Brewster and Pecos counties.

MEXICO: COAHUILA: Municipio de Villa Acuña, near Santo Domingo.

One of the oddest of American milkweeds not only because of the peculiar floral structure, but because of the extreme reduction of the inflorescence. The record

from Coahuila is based upon a mixed collection, Wynd & Muller 464, which was distributed as *Dalea aurea* Nutt. Two sheets of this number in the herbarium of the University of Illinois are *Asclepias sperryi* and I have given to them the number 464a. Dr. C. H. Muller informs me that the milkweeds were collected in Coahuila without doubt, and probably at the same place and date as the *Dalea*.

103. *ASCLEPIAS VIRIDIS* Walt. Fl. Carol. 107. 1788, ex char.

Anthanotis viridis (Walt.) Raf. Fl. Ludov. 52. 1817.

Asclepias procumbens Raf. loc. cit. 51. 1817, ex char.

Anthanotis procumbens (Raf.) Raf. loc. cit. 1817.

Anantherix viridis (Walt.) Nutt. Gen. North Amer. Pl. 1:169. 1818.

Podostigma viridis (Walt.) Ell. Sketch Bot. S. Car. & Ga. 1:327. 1821.

Gomphocarpus viridis (Walt.) Spreng. Syst. 1:849. 1825.

Anantherix ovata Raf. Atl. Jour. 146. 1832, ex char.

Anantherix paniculata Nutt. in Trans. Amer. Phil. Soc. 5:203. 1837, ex char. [T.: Nuttall s. n.]

Anantherix grandiflora Raf. New Fl. North Amer. 4:59. 1838, ex char.

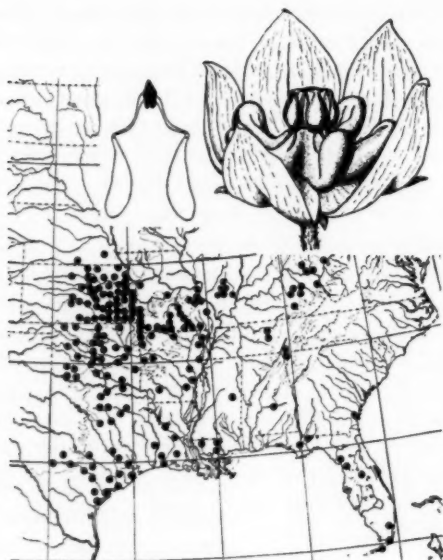
Anantherix torreyana G. Don, Gen. Syst. 4:146. 1838. [Based on *Asclepias viridis* Walt.]

Acrates paniculata (Nutt.) Dcne. in DC. Prodr. 8:521. 1844.

Asclepias longipetala Scheele, in Linnaea 21:757. 1848. [T.: Lindheimer 345, MO!]

Asclepiodora viridis (Walt.) A. Gray, in Proc. Amer. Acad. 12:66. 1877.

Low herbaceous perennials from a stout, subfusiform rootstalk. Stems erect, ascending, or more or less decumbent. Stems usually simple or branched from the caudex, rather stout, 1.5–6.0 dm. tall, essentially glabrous. Leaves irregularly

Fig. 109. *Asclepias viridis* Walt.

approximate, shortly petiolate, ovate to oblong-lanceolate, apex shortly acute to obtuse, base acute to broadly rounded, 4–13 cm. long, 1–6 cm. broad, firmly membranaceous, yellowish green, essentially glabrous; petioles 3–10 mm. long. Inflorescences terminal and solitary or more usually also lateral at few to several of the uppermost nodes, several- to many-flowered, crowded, pedunculate; peduncles 3–6 cm. long, minutely and scatteringly puberulent; pedicels rather slender, 1–3 cm. long, very minutely and sparsely puberulent. Flowers large and rather showy; calyx lobes lanceolate, 4–5 mm. long, essentially glabrous; corolla rotate, pale green, the lobes 1.3–1.5 cm. long, usually with ascending tips; gynostegium sessile, pale purplish rose, the hoods abruptly deflexed from the anther head and with rather shortly ascending rounded clavate tips, 4–6 mm. long, the anther head broadly truncate-conic, about 2 mm. long and broad. Follicles erect on deflexed pedicels, broadly fusiform to ovoid, greatly inflated, shortly apiculate, 6–13 cm. long, 2–3 cm. broad, minutely puberulent to glabrate; seeds oval, about 7 mm. long, the white or pale tawny coma about 4 cm. long.

Glades, prairies, dry hillsides, and dry pine barrens. Tennessee to Florida and westward to Nebraska and eastern Texas. Blooming from April to August.

UNITED STATES:

ALABAMA: Montgomery County.

ARKANSAS: Arkansas, Baxter, Carroll, Craighead, Drew, Logan, Nevada, Poinsett, Prairie, St. Francis, Sebastian, and Washington counties.

FLORIDA: Citrus, Dade, Gadsden, Lake, Levy, Liberty, and Monroe counties.

GEORGIA: Dade and Glynn counties.

ILLINOIS: Bond, Clay, Clinton, Fayette, Marion, Perry, Richland, and Washington counties.

KANSAS: Anderson, Atchison, Barber, Bourbon, Brown, Butler, Cherokee, Chautauqua, Cloud, Coffey, Cowley, Crawford, Dickinson, Douglas, Edwards, Elk, Ellsworth, Franklin, Geary, Greenwood, Harper, Harvey, Jackson, Jefferson, Labette, Linn, Lyon, McPherson, Marshall, Miami, Montgomery, Morris, Neosho, Osage, Osborne, Pawnee, Pottawatomie, Reno, Riley, Saline, Sedgwick, Shawnee, Stafford, Sumner, Wabaunsee, Washington, Wilson, and Woodson counties.

KENTUCKY: Bath, Fayette, Jessamine, Lawrence, Powell, and Rockcastle counties.

LOUISIANA: Acadia, Calcasieu, Cameron, East Feliciana, Natchitoches, Rapides, St. Tammany, and Washington counties.

MISSISSIPPI: Oktibbeha County.

MISSOURI: Barry, Bates, Cass, Christian, Dallas, Dent, Franklin, Howell, Jackson, Jefferson, Jasper, Miller, Moniteau, Ozark, Ste. Genevieve, St. Francois, St. Louis, Taney, and Washington counties.

NEBRASKA: Lancaster and Webster counties.

OHIO: Adams, Highlands, Meigs, and Scioto counties.

OKLAHOMA: Alfalfa, Blaine, Caddo, Cherokee, Choctaw, Cleveland, Comanche, Cotton, Johnson, Kay, Kiowa, Le Flore, Lincoln, Logan, McClain, Murray, Muskogee, Noble, Nowata, Oklahoma, Pawnee, Payne, Pittsburgh, Pottawatomie, Tillman, Tulsa, and Washington counties.

TENNESSEE: Hamilton, Rutherford, and Wilson counties.

TEXAS: Arkansas, Burleson, Caldwell, Calhoun, Collin, Comal, Dallas, Galveston, Gillespie, Grayson, Hays, Harris, Hill, Jackson, Johnson, Kendall, Kerr, Lamar, Matagorda, Navarro, Newton, Refugio, Tarrant, Travis, Van Zandt, Washington, Wharton, and Wood counties.

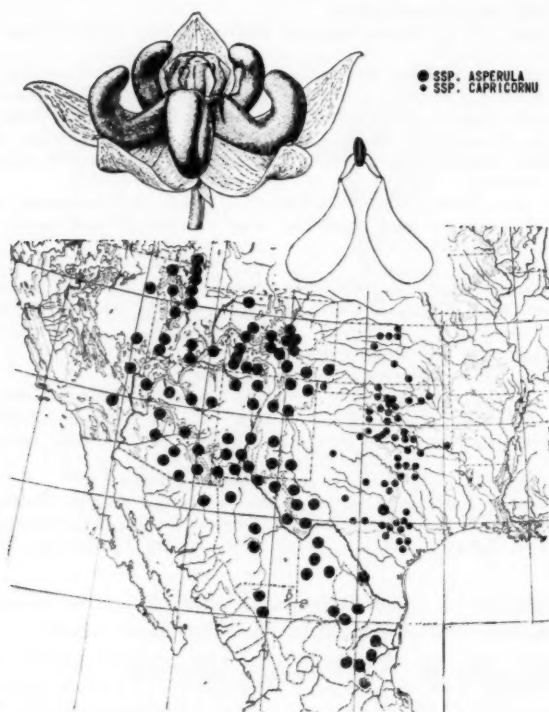
Local populations of *A. viridis* frequently show distinctive variations of leaf size and outline, but on the whole the species is remarkably constant.

104. *ASCLEPIAS asperula* (Dcne.) Woodson, comb. nov.

Acerates asperula Dcne. in DC. Prodr. 8:522. 1844. [T.: *Gbiesbreght s. n.*, P!]

Asclepiodora asperula (Dcne.) Fourn. in Ann. Sci. Nat. Bot. Ser. VI, 14:369. 1882.

Low herbaceous perennials from very stout rootstalks. Stems usually clustered from the rootstalk, ascending or somewhat decumbent, simple, rather stout, 2–6 dm. tall, minutely and rather roughly pilosulose. Leaves irregularly approximate, shortly petiolate, lanceolate to linear-lanceolate, narrowly acuminate, base acute to obtuse, 10–20 cm. long, 1–3 cm. broad, firmly membranaceous, usually more or less conduplicate, minutely and usually rather sparsely pilosulose; petioles 3–7 mm. long. Inflorescences terminal and solitary, usually many-flowered and very crowded, sessile to long-pedunculate; peduncles obsolete to 10 cm. long, minutely and rather sparsely pilosulose, rather stout; pedicels more slender, 1.5–2.5 cm. long, minutely tomentulose. Flowers rather large; calyx lobes ovate to ovate-lanceolate, 4–5 mm. long, minutely pilosulose or puberulent; corolla rotate, pale yellowish green sometimes slightly flushed with purple without, the lobes 9–12 mm. long; gynostegium sessile, the hoods broadly clavate-falciform, abruptly deflexed from the anther head thence with ascending bluntish but tapering tips, 8–10 mm. long, greenish cream to rather dark purple, the anther head very depressed, about 2 mm. long and 5 mm. broad. Follicles erect on deflexed pedicels, rather narrowly fusiform, gradually attenuate, 4–13 cm. long, 1.0–2.5 cm. thick, smooth, minutely pilosulose; seeds oval, 7–8 mm. long, the pale tawny coma about 3 cm. long.

Fig. 110. *Asclepias asperula* (Dcne.) Woods.

KEY TO THE SUBSPECIES

- Inflorescences usually obviously and rather long-pedunculate; hoods usually rather dark purple; leaves usually linear-lanceolate. Colorado and western Texas to Utah, Arizona, Nevada, and adjacent Idaho and California; Tamaulipas westward to Sonora and southward to San Luis Potosí and Hidalgo104a. *A. asperula asperula*
 Inflorescences sessile or subsessile; hoods usually greenish cream; leaves usually more broadly lanceolate. Eastern and central Oklahoma, Texas, and southern Kansas..104b. *A. asperula capricornu*

Asclepias asperula is an obviously necessary correction for my *A. capricornu* ignorantly proposed some years ago. It appears to me that the center of distribution for the species is in northern Mexico, from whence two divergent lines have advanced to the north and northeast respectively, representing the extremes of the two subspecies. At first one might question whether *A. asperula capricornu* might owe its existence to occasional hybridization with *A. viridis*, with which it is frequently associated geographically and ecologically, since its general appearance frequently is somewhat suggestive of the latter. However, there is never any question of the identity of the two species, and I believe that they do not hybridize in nature.

104a. *ASCLEPIAS ASPERULA* ssp. *ASPERULA*.

Asclepias capricornu ssp. *occidentalis* Woodson, in Ann. Missouri Bot. Gard. 32:371. 1945.
[T.: Clokey 8613, MO!]

Flats and desert swales, sandy and rocky hillsides, with pinyon and juniper, oak, mesquite, *Yucca* and *Nolina*. Colorado and western Texas to Utah, Arizona, Nevada, and adjacent Idaho and California; Tamaulipas westward to Sonora and southward to Hidalgo and San Luis Potosí. Blooming from March to August.

UNITED STATES:

ARIZONA: Apache, Cochise, Coconino, Gila, Graham, Maricopa, Mohave, Pima, Pinal, Santa Cruz, and Yavapai counties.

CALIFORNIA: San Bernardino County.

COLORADO: Archuleta, Baca, Boulder, Chaffee, Denver, El Paso, Fremont, Garfield, Huerfano, Jefferson, Lake, La Plata, Las Animas, Moffat, Montezuma, Montrose, Prowers, San Miguel, and Teller counties.

IDAHO: Franklin County.

NEVADA: Clark, Elko, and Lincoln counties.

NEW MEXICO: Catron, Colfax, Dona Ana, Eddy, Grant, Hidalgo, Lincoln, Luna, Otero, Rio Arriba, Sandoval, San Juan, San Miguel, Santa Fe, Sierra, Socorro, and Union counties.

TEXAS: Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, Llano, Pecos, and Presidio counties.

UTAH: Box Elder, Cache, Garfield, Iron, Juab, Kane, Salt Lake, San Juan, Tooele, Utah, Washington, and Weber counties.

MEXICO: CHIHUAHUA: Chihuahua, Santa Eulalia Mtns. COAHUILA: Múzquiz, Cuesta Zozaya, Del Carmen Mtns., Sierra Mojada Mtns., Monclova, Sierra de San Miguel, Saltillo. DURANGO: Ramos, Inde, Tepehuanes. HIDALGO: Jacala. NUEVO LEÓN: Monterrey, Nuevo Laredo, Sierra La Silla, Puerta. SAN LUIS POTOSÍ: Sierra Tablón, Minas de San Rafael, Rascón. SONORA: Sierra Madre. TAMAULIPAS: Jaumave, Victoria.

104b. *ASCLEPIAS ASPERULA* ssp. *capricornu* (Woodson) Woodson, stat. nov.

Anantherix angustifolia Raf. Atl. Jour. 146. 1832, nec *Asclepias angustifolia* Schweigg. nec alior., ex char.

Anantherix decumbens Nutt. in Trans. Amer. Phil. Soc. 5:203, 1837, non *Asclepias decumbens* L. [T.: Nuttall s. n., MO, photo!]

Anantherix nuttalliana G. Don, Gen. Syst. 4:146. 1838, non *Asclepias nuttalliana* nec A. Gray nec Torr. [Based on *Anantherix decumbens* Nutt.]

Acerates decumbens (Nutt.) Dcne. in DC. Prodr. 8:522. 1844.

Asclepiodora decumbens (Nutt.) A. Gray, in Proc. Amer. Acad. 12:67. 1877.

Asclepias decumbens (Nutt.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²:239. 1895, non L.

Asclepias capricornu Woodson, in Ann. Missouri Bot. Gard. 32:370. 1945. [Based on *Anantherix decumbens* Nutt.]

The best nomenclatural procedure here is not entirely clear to me, but it seems preferable to attempt to salvage the name *capricornu*.

Prairies, plains, limestone, sandstone, or clay hills; spreading to pastures. Eastern and central Oklahoma and Texas, southern Kansas. Blooming from March to July.

UNITED STATES:

KANSAS: Cowley, Ellis, Jewell, Mitchell, Osborne, Reno, and Rooks counties.

OKLAHOMA: Beckham, Blaine, Caddo, Carter, Cimarron, Cleveland, Comanche, Custer, Greer, Harmon, Johnston, Kingfisher, McClain, McCurtain, Murray, Oklahoma, Payne, Pottawatomie, Roger Mills, Rogers, Stephens, Tillman, Tulsa, Woodward, and Woods counties.

TEXAS: Bastrop, Bexar, Caldwell, Childress, Comal, Comanche, Cooke, Dallas, De Witt, Eastland, Edwards, Ellis, Erath, Goliad, Grayson, Hays, Hood, Irion, Karnes, Kendall, Kerr, Lubbock, Parker, Tarrant, Taylor, Travis, Williamson, and Wise counties.

SUBGENUS IX. *PODOSTIGMA* (Ell.) Woodson, stat. nov.

Podostigma Ell. Sketch Bot. S. Car. & Ga. 1:326. 1821. [T.: *P. pubescens* Ell.]

KEY TO THE SPECIES

- a. Corolla rotate-campanulate, the lobes broadly ascending, purple or rose; anther head stipe shorter than the hoods.
 - b. Anther head about as long as broad; flowers relatively small, the corolla lobes somewhat longer than 1 cm.; leaves opposite, linear or the lowermost elliptic-lanceolate. Mexico southward to Guerrero and Oaxaca105. *A. circinalis*
 - bb. Anther head broader than long.
 - c. Flowers relatively large, the corolla lobes somewhat longer than 1 cm.; leaves linear to filiform, those of the middle stem congested into false whorls of 4. Jalisco.....106. *A. mcvaughii*
 - cc. Flowers relatively small, the corolla lobes somewhat shorter than 1 cm.; leaves linear, opposite. Durango107. *A. atrovioleacea*
- aa. Corolla rotate-tubular, the lobes erect, greenish cream; anther head stipe much longer than the hoods. Coastal Plain: southern North Carolina to Florida.....108. *A. pedicellata*

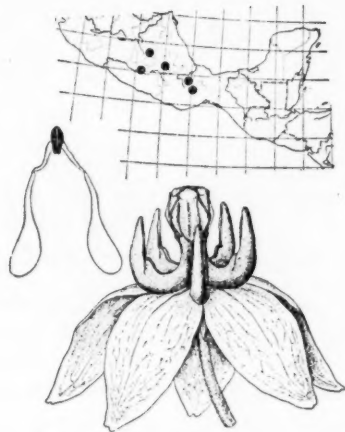
I had long thought *Podostigma* to be the most distinct of the numerous North American segregates of *Asclepias*, because of the very unusual flowers of the single species, *P. pedicellata*. However, *Asclepias circinalis* and *A. atrovioleacea*, so clearly related to *Asclepiodora*, completely close the morphological gap between the two segregates. I am of the opinion that the three species of subgen. *PODOSTIGMA* according to my treatment certainly are not lineally related and that *A. pedicellata* still stands apart, but the opinion is intuitive only.

105. *ASCLEPIAS CIRCINALIS* (Dcne.) Woodson, in Ann. Missouri Bot. Gard. 28:207. 1941.

Acerates circinalis Dcne. in Ann. Sci. Nat. Ser. II, 9:322, t. II f. c. 1838. [T.: *Andrieux* 238, P!]

Asclepiodora circinalis (Dcne.) Fourn. loc. cit. Ser. VI, 14:369. 1882.

Low herbaceous perennials from a fleshy fusiform rootstalk. Stems slender, simple or branching from the caudex, 5–15 cm. tall, very minutely and rather sparsely puberulent, usually dark reddish. Leaves opposite, sessile, linear, 5–13 cm. long, 2–4 mm. broad, membranaceous, revolute, very inconspicuously and sparsely pilosulose. Inflorescences terminal and usually lateral from a few of the uppermost nodes, subsessile or very shortly pedunculate, few- to several-flowered; peduncles slender, obsolete to about 2 cm. long; pedicels very slender, 1–2 cm. long, very inconspicuously pilosulose. Flowers large; calyx lobes narrowly lanceolate, about 3 mm. long, dark purple, very inconspicuously and sparsely pilosulose. Corolla rotate-campanulate, purplish rose, the lobes 1.0–1.5 cm. long; gynostegium sessile but produced into a rather stout stipe about 3 mm. long immediately beneath the anther head, paler rose-purple, the hoods suberect, subfalciform-clavate, 5–6 mm. long, the adnate crest broadly rounded and rather prominent, the anther head about 3 mm. long and broad. Follicles erect on deflexed pedicels, narrowly fusi-

Fig. 111. *Asclepias circinalis* (Dcne.) Woods.

form, long-attenuate, 9–10 cm. long, about 1 cm. broad, sparsely and inconspicuously pilosulose; seeds oval, about 6 mm. long, the pale tawny coma about 4 cm. long.

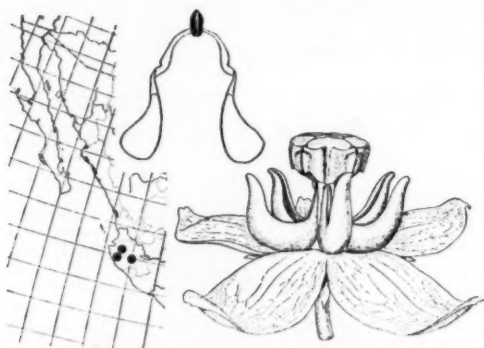
Dry oak and pine woods. Mexico southward to Guerrero and Oaxaca. Blooming from January to September.

MEXICO: GUERRERO: Mina. MEXICO: Temascaltepec. OAXACA: Sierra de San Felipe, Sierra de Ixtlan, San Pedro Yulox. PUEBLA: Caxcatlan.

106. *ASCLEPIAS mcvaughii* Woodson, spec. nov.

Herbae perennes tenues e rhizomate crasso fusiformi. Caules graciles erecti simplices 3–6 dm. alti inconspicue puberuli. Folia linearia vel filiformia inferiora superioraque opposita caeteraque in medio caulis per congestionem nodium false quaternata sessilia 4.5–12.0 cm. longa 1–4 mm. lata membranacea revoluta sat glabra. Inflorescentiae 1–5 in nodis summis laterales pauciflorae; pedunculis ca. 1.5 cm. longis in fructu accrescentibus; pedicellis gracilibus ca. 1 cm. longis. Flores sat magni; calycis laciniis ovato-lanceolatis ca. 3 mm. longis. Corolla rotato-campanulata rosea, lobis ca. 1.2 cm. longis; gynostegio sessili sed sub androecio in stipitem truncate conicum ca. 3 mm. longum producto pallidius roseo, cucullis ascendentibus falciformi-clavatis apicibus attenuatis patulis ca. 5 mm. longis, androecio depresso ca. 1.5 mm. alto 4.5 mm. lato. Folliculi erecti pedicellis reflexis anguste fusiformes 8–9 cm. longi 6–7 mm. crassi laeves glabri, seminibus comosis. —Holotypus: R. McVaugh 13800 in Herb. Univ. Michigan. (State of Jalisco, Mexico, Sierra de la Campana, along road to Mascota, 7–8 miles northwest of Los Volcanes, elevation 1900–2000 m.; pine oak forests west of summits, 23–25 October, 1952.)

The description of the fruits is taken from two specimens without flowers col-

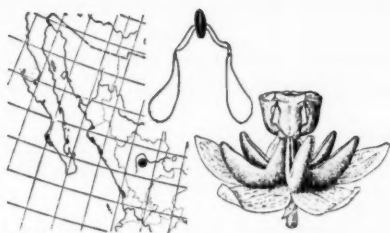
Fig. 112. *Asclepias mcvaughii* Woods.

lected in the same general vicinity by Dr. McVaugh: *McVaugh 14386* (Sierra de Cuale, southwest of Talpa de Allende; southwest of the prominent peak called Piedra Rajada; pine forests near summits, on steep south- and west-facing slopes, elevation 1800–2250 m., 19–21 November, 1952), and *McVaugh 13953* (Sierra de Manantlán, 15–20 miles southeast of Autlán, on the *bajada* south and west of the divide between Aserradero San Miguel Uno and Durazno, elevation ca. 1700 m.; steep west-facing slopes in pine forest, 7 November, 1952).

Asclepias mcvaughii obviously is very closely related to *A. atrovioleacea*, with which I was familiar before I was sent the sheets of the former. In all three sheets of *A. mcvaughii* several of the middle leaf nodes are congested to form false whorls of quaternate leaves, reminiscent of *A. quadrifolia*; the flowers of the holotype are larger, more spreading, and paler than those of *A. atrovioleacea*, and the hoods more conspicuously tapered. It may well be that the two species represent rather two complementary subspecific populations, but our scanty material does not justify this view at the moment. Dr. McVaugh comments that at the two localities where he collected fruit the plants are "occasional" and "frequent, but widely scattered", respectively.

107. *ASCLEPIAS atrovioleacea* Woodson, spec. nov.

Herbae perennes tenues e rhizomate crasso fusiformi. Caules graciles erecti simplices 2–4 dm. alti minute appresse puberuli. Folia opposita aliquando ternata sessilia linearia 3–5 cm. longa ca. 3 mm. lata membranacea revoluta sparsissime minuteque pilosula. Inflorescentiae terminales et in nodo summo laterales pauciflorae brevissime pedunculatae; pedunculis 1–2 cm. longis vel minus; pedicellis gracilibus ca. 6 mm. longis minute appresso-puberulis. Flores mediocres; calycis laciniis ovato-lanceolatis ca. 3 mm. longis. Corolla rotato-campanulata saturate purpurea, lobis ca. 7 mm. longis; gynostegio sessili sed sub androecio in stipitem cylindricum ca. 3 mm. longum producto pallidius purpureo, cucullis ascendentibus late subfalciformi-clavatis ca. 5 mm. longis, androecio depresso ca. 2 mm. longo

Fig. 113. *Asclepias atrovioleacea* Woods.

4 mm. lato. Folliculi mihi ignoti.—Holotypus: J. N. Rose 2250 in Herb. Missouri Bot. Gard., isotypus in Herb. U. S. Nat. Mus. (State of Durango, Mexico, locality lacking, August 13, 1897).

If this odd little plant had been collected in Florida, there would be no question of its close affinity with *A. pedicellata*. I feel that the development of the two species probably has been convergent rather than lineal, however.

108. *ASCLEPIAS PEDICELLATA* Walt. Fl. Carol. 106. 1788, ex char.

Stylandra pumila Nutt. Gen. North Amer. Pl. 1:170. 1818. [T.: Nuttall s. n., MO, photo!]

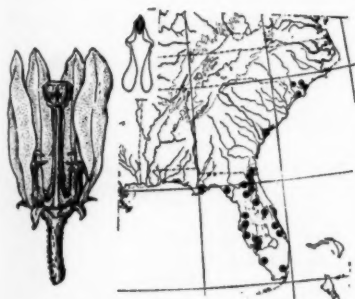
Antbanotis pedicellata (Walt.) Raf. Fl. Ludov. 52. 1817.

Podostigma pubescens Ell. Sketch Bot. S. Car. & Ga. 1:326. 1821, ex char.

Anantherix pumilus (Nutt.) Nutt. in Trans. Amer. Phil. Soc. 5:203. 1837.

Podostigma pedicellata (Walt.) Vail, ex Small, Fl. Southeast. U. S. 939. 1903.

Low herbaceous perennials from a tuberous fusiform rootstalk. Stems erect, slender, simple, 1–5 dm. tall, minutely and rather sparsely puberulent. Leaves opposite, sessile, linear to ovate-lanceolate, apex acuminate, base acute or obtuse, 2–5 cm. long, 3–10 mm. broad, firmly membranaceous, minutely and rather sparsely puberulent particularly beneath. Inflorescences terminal and lateral at the uppermost few nodes, few-flowered, shortly pedunculate; peduncle slender, 1.0–2.5

Fig. 114. *Asclepias pedicellata* Walt.

cm. long, minutely puberulent; pedicels very slender, about 1 cm. long, very minutely puberulent. Flowers rather mediocre; calyx lobes ovate, about 2 mm. long, essentially glabrous; corolla rotate-tubular, greenish cream, the lobes nearly erect, nearly 1 cm. long; gynostegium sessile but produced into a rather slender stipe about 5 mm. long, directly beneath the anther head, the hoods erect, sub-ampulliform, about 3 mm. long, the

anther head depressed-obconic, about 1 mm. long and 2 mm. broad. Follicles unknown.

Pine barrens and flatwoods. Florida and coastal Georgia, South Carolina and North Carolina. Blooming from May to June.

UNITED STATES:

FLORIDA: Alachua, Brevard, Charlotte, Clay, Collier, Dade, De Soto, Dixie, Duval, Franklin, Hernando, Hillsborough, Lake, Manatee, Marion, Nassau, Orange, Putnam, and St. Lucie counties.

GEORGIA: Charlton County.

NORTH CAROLINA: Bladen, Brunswick, New Hanover, and Pender counties.

SOUTH CAROLINA: Beaufort County.

This artfully contrived little species is a far cry indeed from *Asclepias incarnata*, but connected to it through innumerable intergrading mutations amongst the intervening scores of species, as we have seen.

ENUMERATION OF THE SPECIES

SUBGENUS I. ASCLEPIAS

SERIES 1. INCARNATAE

1. *incarnata* L.
 - 1a. ssp. *incarnata*
 - 1b. ssp. *pulchra* (Ehrh.) Woods.
2. *texana* Heller
3. *perennis* Walt.
4. *woodsoniana* Standl. & Steyerl.
5. *linearis* Scheele
6. *pseudorubricaulis* Woods.
7. *curassavica* L.
8. *nivea* L.
9. *angustifolia* Schweig.
10. *fascicularis* Dcne.
11. *subverticillata* (A. Gray) Vail
12. *mexicana* Cav.
13. *verticillata* L.
14. *pumila* (A. Gray) Vail
15. *leptopus* I. M. Johnston
16. *gentryi* Standl.

SERIES 2. TUBEROSAE

17. *tuberosa* L.
 - 17a. ssp. *tuberosa*
 - 17b. ssp. *rolfsii* (Britton) Woods.
 - 17c. ssp. *interior* Woods.
 - 17d. ssp. *terminalis* Woods.
18. *rubra* L.
19. *lanceolata* Walt.

SERIES 3. EXALTATAE

20. *ovata* Mart. & Gal.
21. *similis* Hemsl.
22. *contrayerba* Sessé & Moc.

23. *exaltata* L.
24. *coulteri* A. Gray
25. *quinquedentata* A. Gray
26. *amplexicaulis* Sm.
27. *virletii* Fourn.
28. *scaposa* Vail

SERIES 4. GRANDIFLORAE

29. *crocea* Woods.
30. *grandiflora* Fourn.
31. *glaucescens* HBK.

SERIES 5. SYRIACAE

32. *quadrifolia* Jacq.
33. *viridula* Chapm.
34. *pellucida* Fourn.
35. *ovalifolia* Dcne.
36. *syriaca* L.
37. *humistrata* Walt.
38. *meadii* Torr.
39. *hypoleuca* (A. Gray) Woods.
40. *pringlei* (Greenm.) Woods.
41. *pratensis* Benth.
42. *linaria* Cav.

SERIES 6. PURPURASCENTES

43. *sullivantii* Engelm.
44. *variegata* L.
45. *purpurascens* L.
46. *ballii* A. Gray
47. *lanuginosa* HBK.
48. *curtissii* A. Gray
49. *speciosa* Torr.
50. *euphorbiaefolia* Engelm.

SERIES 7. MACROTIDES

- 51. *micbauxii* Dcne.
- 52. *conzattii* Woods.
- 53. *involucrata* Engelm.
- 54. *macroserpa* Eastw.
- 55. *puberula* A. Gray
- 56. *macrotis* Torr.
- 57. *lemmoni* A. Gray
- 58. *laxiflora* (Benth.) Dcne.

SERIES 8. ROSEAE

- 59. *tomentosa* Ell.
- 60. *arenaria* Torr.
- 61. *latifolia* Raf.
- 62. *obovata* Ell.
- 63. *labriformis* M. E. Jones
- 64. *erosa* Torr.
- 65. *eriocarpa* Benth.
- 66. *masonii* Woods.
- 67. *subaphylla* Woods.
- 68. *albicans* S. Wats.
- 69. *vestita* H. & A.
 - 69a. ssp. *vestita*
 - 69b. ssp. *parishii* (Jeps.) Woods.
- 70. *nummularia* Torr.
- 71. *rosea* HBK.

SERIES 9. FRUTICOSAE

- 72. *fruticosa* L.

SUBGENUS II. PODOSTEMMA (Greene)
Woods.

- 73. *auriculata* HBK.
- 74. *subulata* Dcne.
- 75. *nyctaginifolia* A. Gray
- 76. *oenotheroides* Cham. & Schlecht.
- 77. *emoryi* (Greene) Vail
- 78. *standleyi* Woods.

SUBGENUS III. ANANTHERIX (Nutt.)
Woods.

- 79. *connivens* Baldw.

SUBGENUS IV. ASCLEPIODELLA (Small)
Woods.

- 80. *cinerea* Walt.
- 81. *feayi* Chapm.

- 82. *brachystephana* Engelm.
- 83. *rutbiae* Maguire
- 84. *cutleri* Woods.
- 85. *uncialis* Greene
- 86. *cordifolia* (Benth.) Jeps.

SUBGENUS V. ACERATES (Ell.) Woods.

- 87. *vinosa* (Fourn.) Woods.
- 88. *hirtella* (Pennell) Woods.
- 89. *longifolia* Michx.
- 90. *viridiflora* Raf.
- 91. *nuttalliana* Torr.

SUBGENUS VI. SOLANOEA (Greene) Woods.

- 92. *californica* Greene
 - 92a. ssp. *californica*
 - 92b. ssp. *greenii* Woods.
- 93. *cryptoceras* S. Wats.
 - 93a. ssp. *cryptoceras*
 - 93b. ssp. *davisii* (Woods.) Woods.
- 94. *solanoana* Woods.

SUBGENUS VII. POLYOTUS (Nutt.) Woods.

- 95. *stenophylla* A. Gray
- 96. *rusbyi* (Vail) Woods.
- 97. *engelmanniana* Woods.

SUBGENUS VIII. ASCLEPIODORA (A. Gray)
Woods.

- 98. *clata* Benth.
- 99. *mirifica* Woods.
- 100. *fournieri* Woods.
- 101. *zanthodacryon* (L. B. Sm.) Woods.
- 102. *sperryi* Woods.
- 103. *viridis* Walt.
- 104. *asperula* (Dcne.) Woods.
 - 104a. ssp. *asperula*
 - 104b. ssp. *capricornu* (Woods.) Woods.

SUBGENUS IX. PODOSTIGMA (Ell.) Woods.

- 105. *circinalis* (Dcne.) Woods.
- 106. *mcvaughii* Woods.
- 107. *atroviolacea* Woods.
- 108. *pedicellata* Walt.

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